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PART I

BIOVENTING PILOT TEST WORK PLAN FOR POL YARD AREA 3, SITE ST-38 MOUNTAIN HOME AFB, IDAHO

PART II

DRAFT INTERIM PILOT TEST RESULTS REPORT FOR POL YARD AREA 3, SITE ST-38 MOUNTAIN HOME AFB, IDAHO

Prepared For

AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE BROOKS AFB, TEXAS

and

366 CES/CEV MOUNTAIN HOME AFB, IDAHO

October 1994

ES ENGINEERING-SCIENCE

ENGINEERING-SCIENCE, INC.
1700 Broadway, Suite 900 • Denver, Colorado 80290

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PART I

BIOVENTING PILOT TEST WORK PLAN FOR POL YARD AREA 3, SITE ST-38 MOUNTAIN HOME AFB, IDAHO

OCTOBER 1994

Prepared for:

Air Force Center for Environmental Excellence
Brooks AFB, Texas

and

366 CES/CEV
Mountain Home, Idaho

Prepared by:

Engineering-Science, Inc.
1700 Broadway, Suite 900
Denver, Colorado 80290

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BIOVENTING PILOT TEST WORK PLAN FOR POL YARD AREA 3, SITE ST-38 MOUNTAIN HOME AFB, IDAHO

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BIOVENTING PILOT TEST WORK PLAN FOR POL YARD AREA 3, SITE ST-38 MOUNTAIN HOME AFB, IDAHO

FIGURES

BIOVENTING PILOT TEST WORK PLAN FOR POL YARD AREA 3, SITE ST-38 MOUNTAIN HOME AFB, IDAHO

1.0 INTRODUCTION

This work plan presents the scope of an *in situ* bioventing pilot test for treatment of fuel-contaminated soils at the petroleum, oils, and lubricants (POL) Yard Area 3 (Site ST-38) at Mountain Home Air Force Base (AFB), Idaho. The pilot test has three primary objectives: 1) to assess the potential for supplying oxygen throughout the contaminated soil interval, 2) to determine the rate at which indigenous microorganisms will degrade fuel when stimulated by oxygen-rich soil gas, and 3) to evaluate the potential for sustaining these rates of biodegradation until fuel contamination is remediated to concentrations below regulatory standards.

The pilot test will be conducted in two phases. A vent well (VW) and monitoring points (MPs) will be installed during site investigation activities. The initial stage will also include an *in situ* respiration test and an air permeability test. This initial testing is expected to take approximately 2 weeks. During the second phase, a bioventing system will be installed and monitored over a 1-year period.

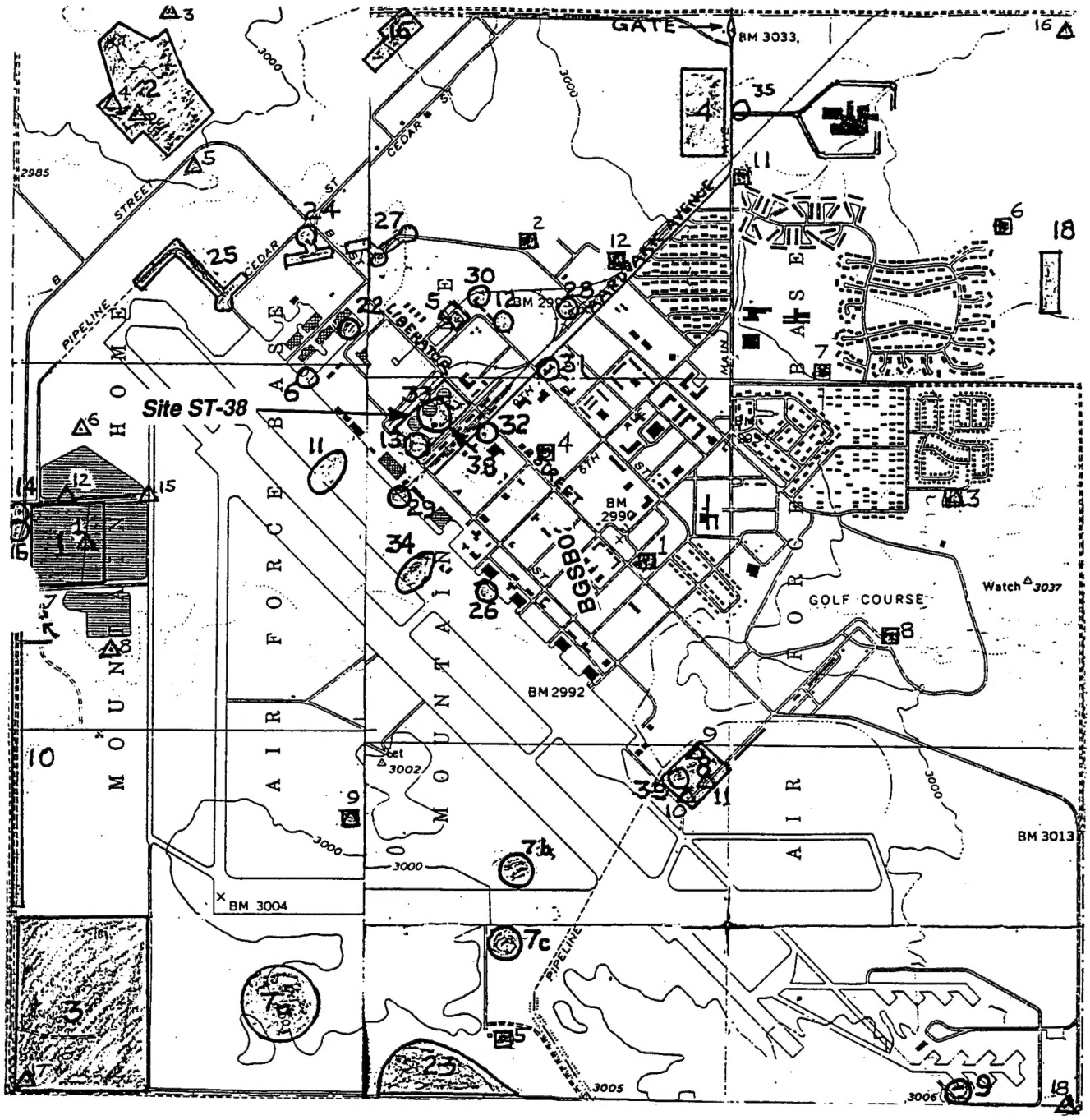
If bioventing proves to be feasible at this site, pilot test data could be used to design a full-scale remediation system and to estimate the time required for site cleanup. An added benefit of the pilot testing at Site ST-38 is that a significant amount of the fuel contamination should be biodegraded during the 1-year pilot test, as the testing will take place within the most contaminated soils at the site.

Additional background information on the development and recent success of the bioventing technology is found in the *Test Plan and Technical Protocol For A Field Treatability Test For Bioventing* (Hinchee et al., 1992). This protocol document will also serve as the primary reference for pilot test VW and MP designs and detailed procedures which will be used during the test.

2.0 SITE DESCRIPTION

2.1 Site Location and History

Site ST-38 is an active POL yard consisting of above- and below-ground product and waste storage tanks, and piping and manifold systems for delivery and receipt of petroleum product. The location of the POL yard with respect to the base is shown on Figure 2.1. Currently located in the yard are three 1.5-million-gallon JP-4 tanks, one 600,000-gallon and one 500-gallon diesel oil tanks, four 21,000-gallon gasoline tanks, two



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LEGEND

IRP Sites

FIGURE 2.1

SITE ST-38 LOCATION WITH RESPECT TO BASE

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

500-gallon tanks of unknown product/waste, one 500-gallon tank of mixed hazardous waste, and one 55,000-gallon tank of ethylene glycol. A row of hydrants located parallel to the tracks were formerly used for railcar off-loading of JP-4 fuel; however, railcar transport of fuel has been replaced by a fuel pipeline, and the base relies solely on a pipeline from Mountain Home, Idaho for JP-4 supplies. Currently, fuel transfer pumps are used for loading diesel, MOGAS (gasoline), and, infrequently, JP-4 into truck tankers.

Previous investigations conducted by Woodward-Clyde (1994) identified seven "hot spot" areas of petroleum hydrocarbon soil contamination within the POL yard based on soil gas surveys and soil sampling results. Area 3, located adjacent to Building 1321, is the proposed bioventing pilot test location. Figure 2.2 shows the location of the identified "hot spot" areas within the POL yard and the proposed pilot test location Subsurface leakage from the low point drain for a JP-4 pipeline, located on the north side of Building 1321, is the reported source for hydrocarbon contamination at Area 3 (Woodward-Clyde, 1994).

2.2 Site Geology

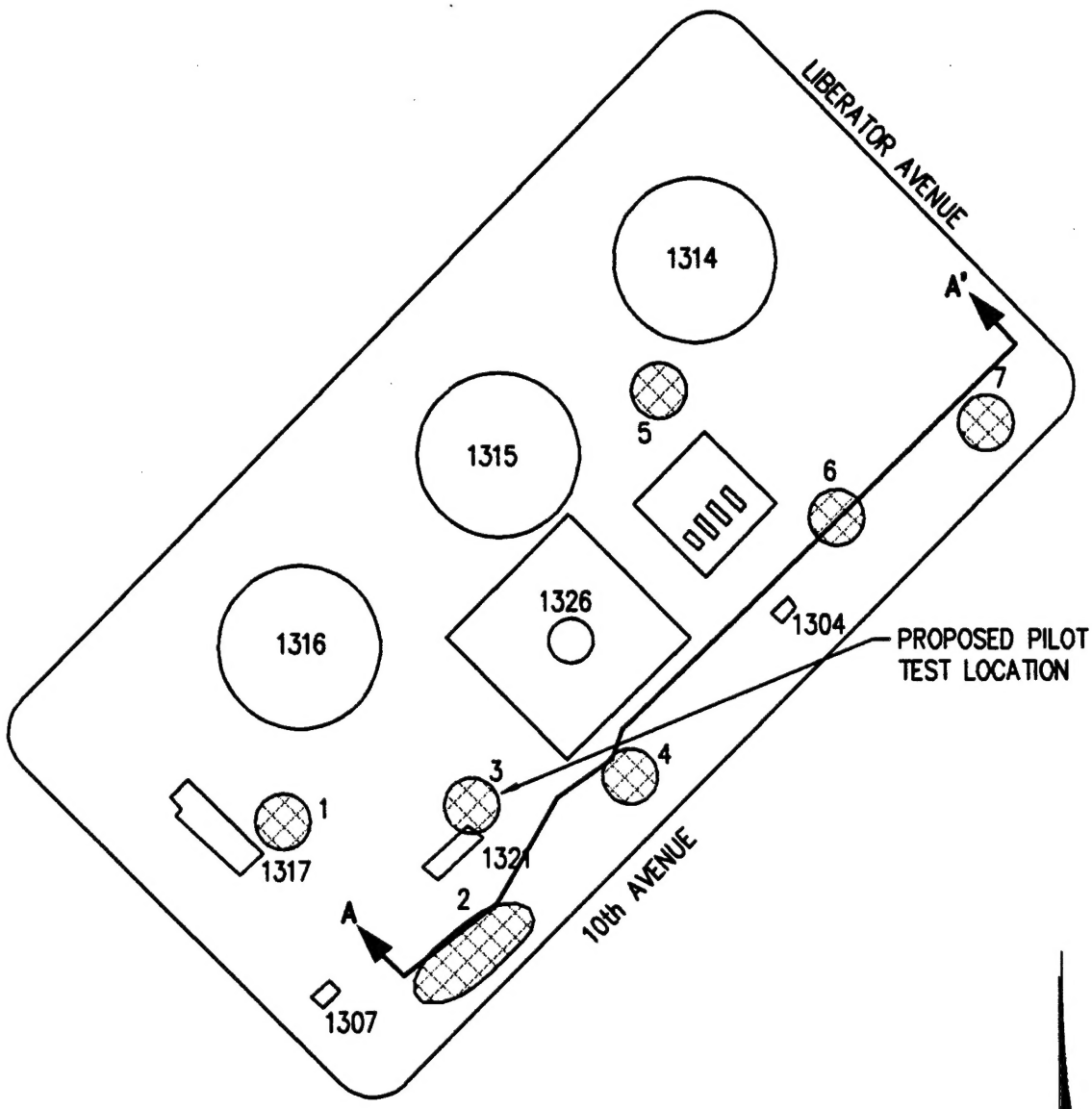
Geologic units beneath the POL yard consist of loess deposits overlying basalt bedrock. The unconsolidated loess deposits are predominantly brown, silt and sandy silt with occasional, thin, sand and gravely interbeds. The top of the basalt bedrock was encountered at approximately 24 feet bgs at boring ST38-003-SB. The basalt bedrock consists of a number of distinct flows with varying physical characteristics. Based on rock core ST38-003-RC previously drilled at Area 3, bedrock consists of vesicular basalt with occasional fractured zones, grading to dense, cryptocrystalline basalt at a depth of approximately 75 feet bgs. Figure 2.3 is a cross-section through Site 38.

Groundwater beneath the site occurs at a depth of approximately 400 feet bgs. A thin, perched, saturated zone was encountered in a basalt rubble zone overlying more impermeable basalt at a depth of approximately 36 feet bgs. No saturated zones were encountered within the soils overlying the bedrock.

2.3 Site Contaminants

The contaminants at this site are petroleum hydrocarbons, which have been detected in the soils at depths ranging from the surface to the bedrock surface at a depth of 25 feet bgs (ST38-003-SB) and within the upper part of the bedrock. Maximum gasoline-range organics (GRO) and total chromatographic organics (TCO) concentrations of 6,300 milligrams per kilogram (mg/kg) and 1,400 mg/kg, respectively, were measured in soil samples from a depth of 15 feet bgs. Although soil benzene, toluene, ethylbenzene, and xylene (BTEX) soil results were not available at the time this work plan was prepared, soil gas sampling results ranging from 4,650 parts per billion, volume per volume (ppbv) for benzene to 317 ppbv for ethylbenzene, indicate significant soil BTEX contamination.

Comparison of the analytical results of soil and bedrock samples collected at Site ST-38 indicates that the majority of the hydrocarbon contamination is in the soils, with much lower concentrations detected in the bedrock. At Area 3 (the pilot test area) maximum soil sample headspace and TCO results were 1,503 parts per million (ppmv) and 17,000



LEGEND

A A' — LOCATION OF GEOLOGIC CROSS SECTION

6 — "HOT SPOT" AREA LOCATION

1307 — BUILDING LOCATION ANDNUMBER

1316 — AST LOCATION AND NUMBER

0 25 50 100 200
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FIGURE 2.2

SITE ST-38 LOCATION

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

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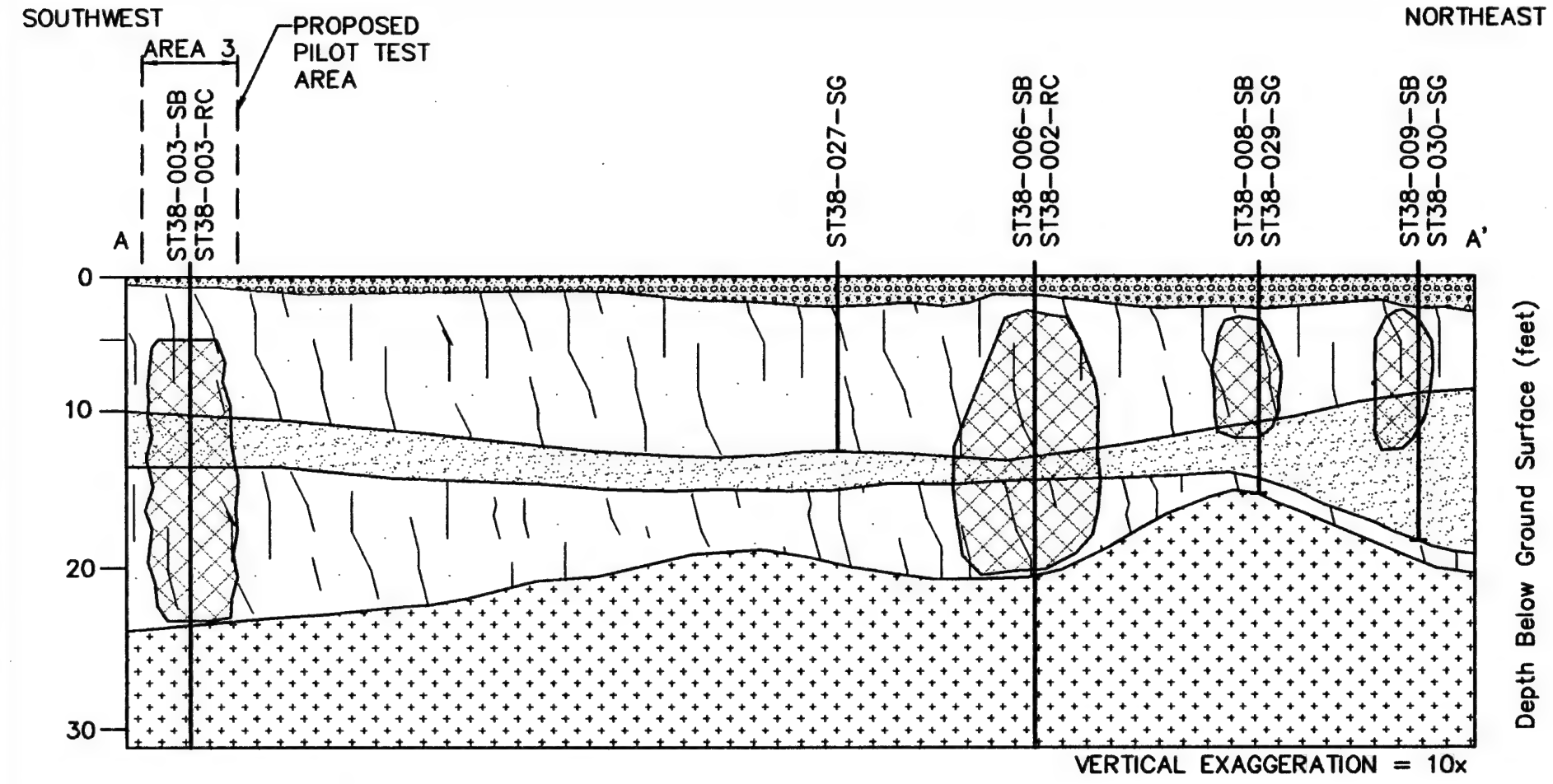


LITHOLOGIC DESCRIPTION

- SILT AND GRAVEL
- SILT
- SILTY SAND
- BASALT BEDROCK

LEGEND

ST38-006-SB	SOIL BORING LOCATION
ST38-003-RC	ROCK CORE LOCATION
ST38-027-SG	SOIL GAS SURVEY POINT LOCATION
	SOIL HYDROCARBON CONTAMINATION BASED ON SOIL GAS AND/OR SOIL ANALYTICAL RESULTS

FIGURE 2.3

GEOLOGIC CROSS SECTION A-A
SITE ST-38

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.
Denver, Colorado

94DN0536, 10/05/94 at 14:00

mg/kg, respectively, while the maximum headspace result for the rock core sample (ST38-002-RC) was 213 ppmv in a highly fractured zone approximately 3 feet below the top of the bedrock surface. A similar trend exists at Area 3 where the immunoassay results were greater than 1,000 ppmv for soil, and less than 100 ppmv for bedrock samples.

3.0 SITE SPECIFIC ACTIVITIES

The purpose of this section is to describe the work that will be performed by Engineering-Science, Inc. (ES) at Site ST-38, Area 3. Activities that will be performed include siting and construction of a central air injection well, or VW, and three vapor MPs; an *in situ* respiration test; an air permeability test; and the installation of a long-term bioventing pilot test system. Soil and soil gas sampling procedures and the blower configuration that will be used to inject air (oxygen) into contaminated soils through the VW are also discussed in this section. No dewatering will take place during the pilot test. Pilot test activities will be confined to unsaturated soils remediation. Existing monitoring wells will not be used as primary air injection wells. However, monitoring wells which have a portion of their screened interval above the water table may be used as vapor MPs or to measure the composition of background soil gas.

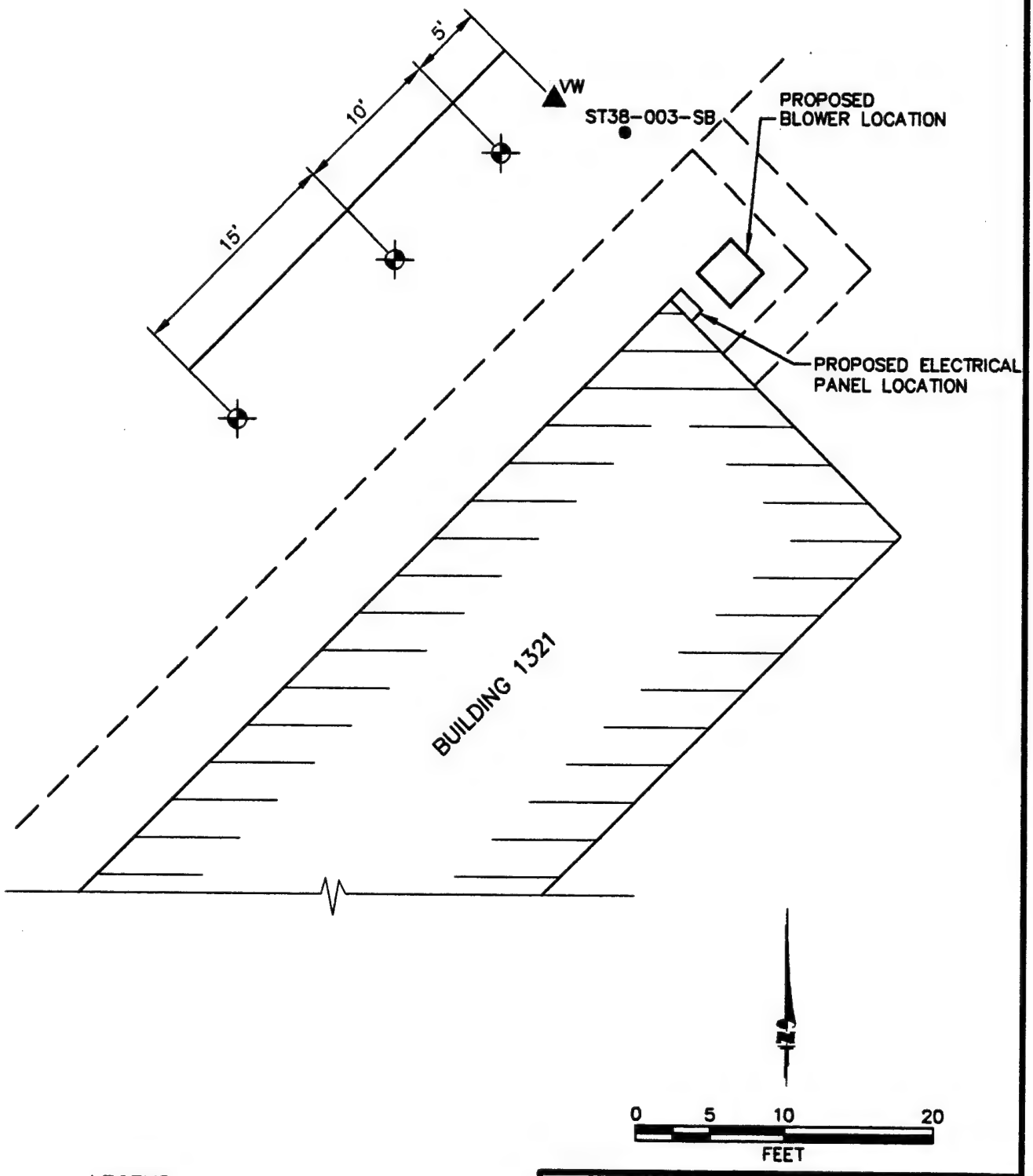
3.1 Site Layout

A general description of criteria for siting a central VW and vapor MPs are included in the protocol document (Hinchee et al., 1992). Figure 3.1 illustrates the proposed locations of the central VW and MPs at this site. The final locations of these wells may vary slightly from the proposed locations if significant fuel contamination is not observed in the boring for the VW. Based on site investigation data, the central VW should be located near soil boring ST38-003-SB. Soils in this area are expected to be oxygen depleted (<2%) due to high hydrocarbon levels, and increased biological activity should be stimulated by oxygen-rich soil gas ventilation during pilot test operations.

Based on the depth of contamination at this site and the experience that ES has had with similar soil types, the potential radius of venting influence around the central air injection well is expected to be 30 to 40 feet. Three vapor MPs (MPA, MPB, and MPC) will be located within a 30-foot radial distance of the central VW. A fourth MP (exact location to be determined in the field) will be located within approximately 1,000 feet of the site, in an uncontaminated area, and will be used to measure background levels of oxygen and carbon dioxide and to determine if natural carbon sources are contributing to oxygen uptake during the *in situ* respiration test.

3.2 Vent Well

The VW will be constructed of 4-inch inside-diameter (ID) schedule 40 PVC, with a 15-foot interval of 0.04-inch slotted screen set at approximately 5 to 20 feet bgs. Flush-threaded PVC casing and screen with no organic solvents or glues will be used. The filter pack will be clean, well-rounded silica sand with an 8-12 grain size, and will be placed in the annular space of the screened interval. A 2-foot layer of granular bentonite, hydrated in place with potable water, will be placed directly over the filter pack to produce an air-



LEGEND

ST38-003-SB ● EXISTING SOIL BOREHOLE LOCATION

APPROXIMATE LOCATION OF BURIED JP-4 PIPELINE

▲ PROPOSED VENT WELL LOCATION

PROPOSED MONITORING POINT LOCATION

FIGURE 3.1

PROPOSED VENT WELL, MONITORING POINT, AND BLOWER LOCATIONS SITE ST-38, AREA 3

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

94DN0593, 10/06/94 AT 13:30

tight seal above the screened interval. A complete seal is critical to prevent injected air from short circuiting to the surface during the bioventing test. The remaining annular space will then be filled to the ground surface with bentonite/cement grout. Figure 3.2 illustrates the proposed VW construction for this site.

3.3 Monitoring Points

A typical multi-depth vapor MP installation for this site is shown in Figure 3.3. Soil gas oxygen and carbon dioxide concentrations will be monitored at depths of 5, 12, and 20 feet bgs at each location. Soil temperature will be monitored using thermocouples installed at depths of 5 feet and 20 feet at MPA. Multi-depth monitoring will confirm that the entire soil profile is receiving oxygen and be used to measure fuel biodegradation rates at each depth.

The MPs will be constructed with three vapor probes. Each vapor probe, constructed of a 6-inch-long section of 1-inch-diameter PVC well screen, will be placed within a 2-foot layer of 6-9 sieve-size silica sand. The annular space between the three screened MP intervals will be sealed with bentonite to isolate the intervals. The bentonite seals will consist of granular bentonite or bentonite pellets hydrated in place. The bentonite within 2 feet above and below the sand intervals will be placed in approximately 6-inch layers and hydrated with potable water prior to placement of subsequent layers to assure complete saturation and hydration of the bentonite. Additional details on VW and MP construction are found in Section 4 of the protocol document (Hinchee et al., 1992).

3.4 Handling of Drill Cuttings

Cuttings will be collected in US Department of Transportation (DOT) approved containers. The containers will be labeled, and then stored at facilities on Mountain Home AFB. Drill cuttings will become the responsibility of Mountain Home AFB, or their designated contractor, and will be analyzed and disposed of in accordance with the current procedures for ongoing remedial investigations.

3.5 Soil and Soil Gas Sampling

3.5.1 Soil Samples

Three soil samples will be collected from the pilot test area during the installation of the VW and MPs. Sampling procedures will follow those outlined in the protocol document. A total hydrocarbon vapor analyzer will be used during drilling to screen split-spoon samples for intervals of high fuel contamination. Based on field screening results, one soil sample will be collected from the most contaminated interval of the VW boring, and one sample will be collected from the interval of highest apparent contamination in each of the borings for the two MPs closest to the VW. Soil samples will be analyzed in duplicate for total recoverable petroleum hydrocarbons (TRPH), BTEX, and a single sample will be analyzed for soil moisture, pH, particle sizing, alkalinity, total iron, and nutrients.

Samples for TRPH and BTEX analysis will be collected using a split-spoon sampler containing brass tube liners. Soil samples collected in the brass tubes for TRPH, BTEX, and physical parameter analyses will be immediately trimmed, and the ends will be sealed

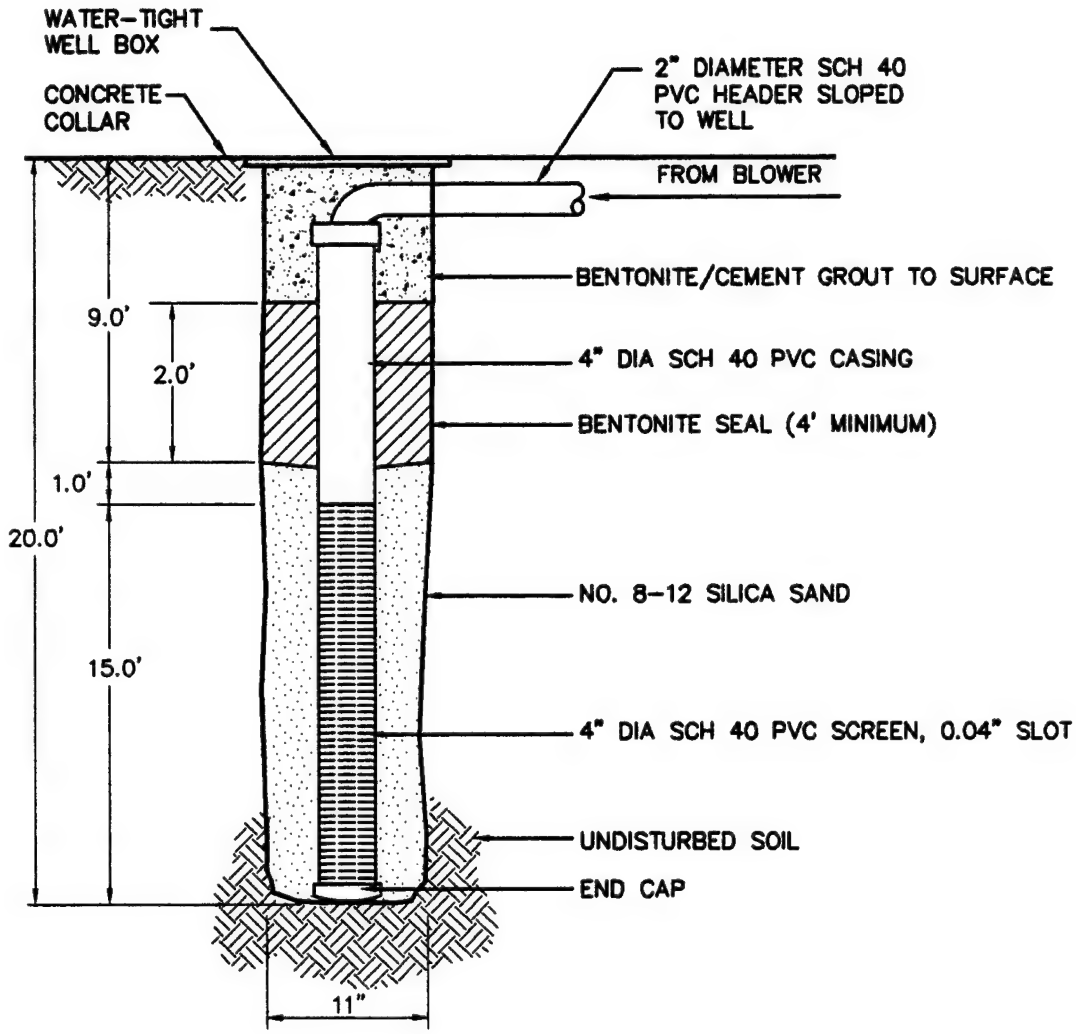


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FIGURE 3.2

PROPOSED INJECTION/EXTRACTION VENT WELL CONSTRUCTION DETAIL SITE ST-38, AREA 3

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

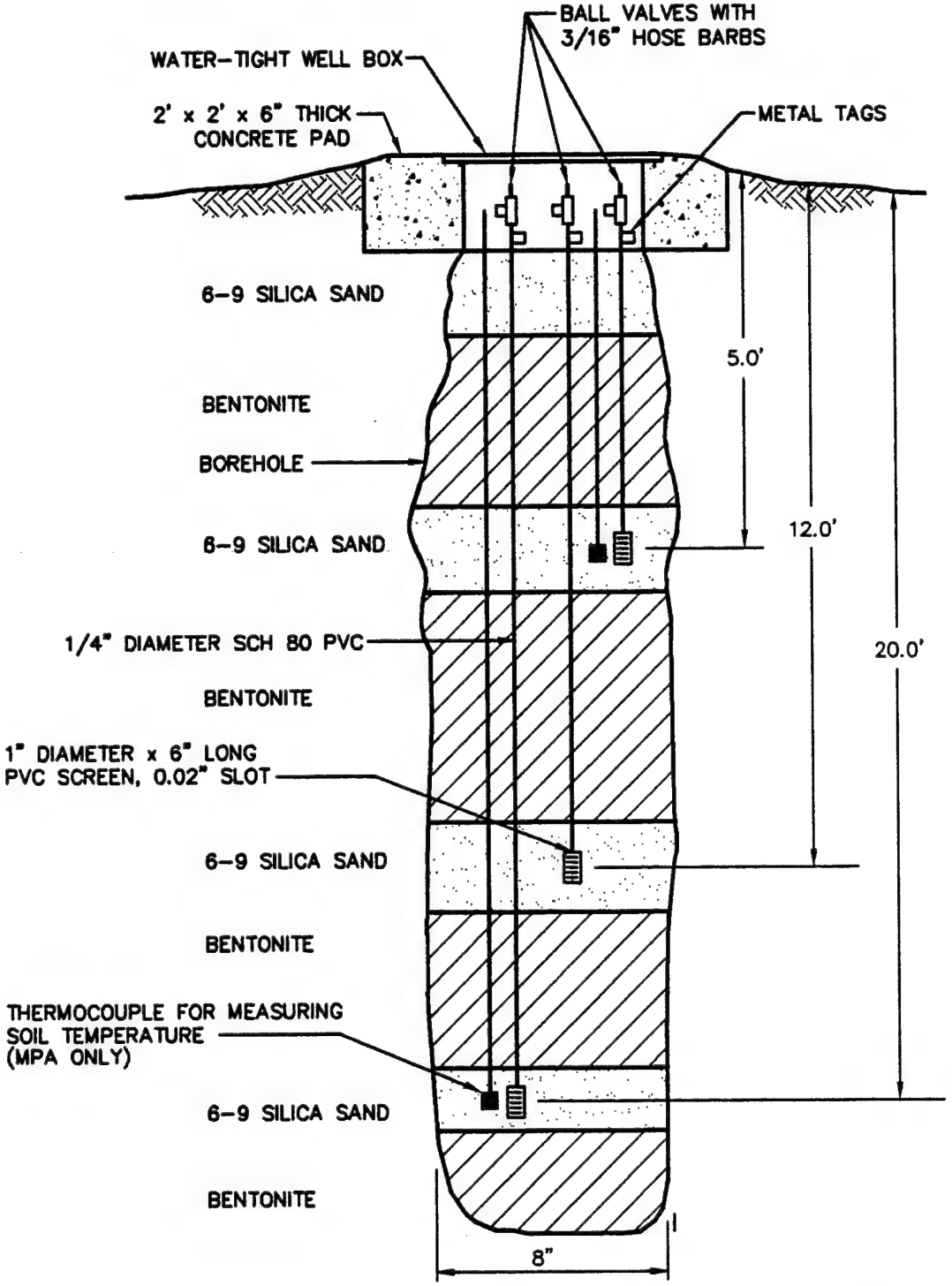

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FIGURE 3.3

PROPOSED MONITORING POINT CONSTRUCTION DETAIL SITE ST-38, AREA 3

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

with aluminum foil or Teflon® fabric held in place by plastic caps. Soil samples will be labeled following the nomenclature specified in the protocol document (Section 5), wrapped in plastic, placed in a cooler, and maintained at a temperature of 4 degrees centigrade for shipment. A chain-of-custody form will be filled out, and the cooler will be shipped to the PACE, Inc. laboratory in Huntington Beach, California for analysis. This laboratory has been audited by the Air Force and meets all quality assurance/quality control (QA/QC) and certification requirements for the State of California.

3.5.2 Soil Gas Samples

Initial soil gas samples will be collected in SUMMA® canisters in accordance with the Bioventing Field Sampling Plan (ES, 1992) from the VW and from the MPs closest to and furthest from the VW. Additionally, these soil gas samples will be used to predict potential air emissions, to determine the reduction in BTEX and total volatile hydrocarbons (TVH) during the 1-year test, and to detect any migration of these vapors from the source area.

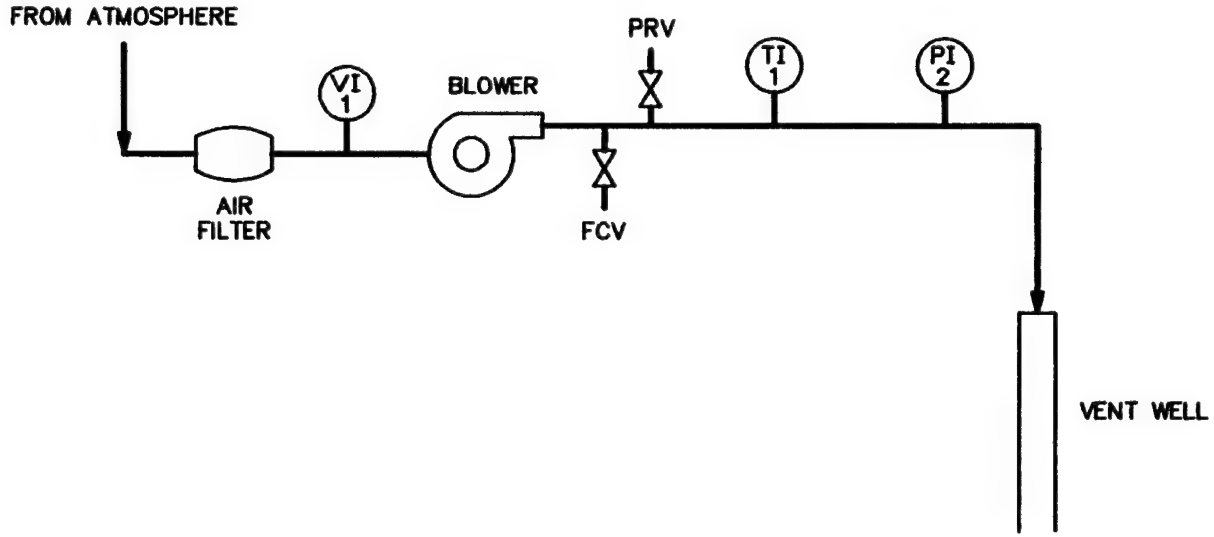
Soil gas sample canisters will be placed in a small cooler and packed with foam pellets to prevent excessive movement during shipment. Samples will not be sent on ice to prevent condensation of hydrocarbons. A chain-of-custody form will be filled out, and the cooler will be shipped to the Air Toxics, Inc. laboratory in Folsom, California for analysis.

3.6 Blower System

A 3-horsepower positive-displacement blower capable of injecting air over a wide range of flow rates and pressures will be used to conduct the initial air permeability test and *in situ* respiration test. Figure 3.4 is a schematic of a typical air injection system used for pilot testing. The maximum power requirement anticipated for this pilot test is 230-volt, single-phase, 30-amp service. Additional details on power supply requirements are described in Section 5.0, Base Support Requirements.

3.7 *In Situ* Respiration Test

The objective of the *in situ* respiration test is to determine the rate at which soil bacteria degrade petroleum hydrocarbons. Respiration tests will be performed at selected MPs where bacterial biodegradation of hydrocarbons is indicated by low oxygen levels and elevated carbon dioxide concentrations in the soil gas. Using 1-cubic-foot-per-minute (cfm) pumps, air will be injected into approximately four MP depth intervals containing low levels (<2%) of oxygen. A 20-hour air injection period will be used to oxygenate local contaminated soils. At the end of the 20-hour air injection period, the air supply will be cut off, and oxygen, carbon dioxide, and TVH concentrations will be monitored for the following 48 to 72 hours. The decline in oxygen and increase in carbon dioxide concentrations over time will be used to estimate rates of bacterial degradation of fuel residuals. Helium will also be injected into the selected MP screened intervals to determine the effectiveness of the bentonite seals. Additional details on the *in situ* respiration test are found in Section 5.7 of the protocol document (Hinchee et al., 1992).



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VI 1	VACUUM INDICATOR
PI 2	PRESSURE INDICATOR
TI 1	TEMPERATURE INDICATOR
FCV	FLOW CONTROL VALVE
PRV	PRESSURE RELIEF VALVE

FIGURE 3.4

PROPOSED BLOWER SYSTEM INSTRUMENTATION DIAGRAM FOR AIR INJECTION

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

3.8 Air Permeability Test

The objective of the air permeability test is to determine the extent of the subsurface that can be oxygenated using one air injection VW. Prior to initiating the test, baseline concentrations of oxygen, carbon dioxide, moisture, and TVH will be measured in soil gas from the VW and each MP screened interval.

Air will be injected into the 4-inch-diameter VW using the blower unit, and pressure response will be measured at each MP with differential pressure gauges to determine the region influenced by the unit. Oxygen will also be monitored in the MPs to ascertain whether oxygen levels in the soil increase as the result of air injection. One air permeability test lasting 4 to 24 hours will be performed.

3.9 Installation of Extended (1-Year) Pilot Test Bioventing System

An extended, 1-year bioventing system will also be installed at Site ST-38. The system will be chosen based upon the results of the initial respiration and permeability tests. However, it is anticipated that the extended test blower will have flow rates in the range of 10 to 20 cfm and will not exceed 2.5 horsepower. A base electrician will be requested to wire the blower to line power. The blower will be housed in a small, prefabricated shed to provide protection from the weather. The blower unit will be explosion-proof, and electrical wiring will be installed in accordance with the national electric code (NEC) and base codes for locations with explosive atmospheres.

The system will be in operation for 1 year, and every 6 months ES personnel will conduct *in situ* respiration tests to monitor the long-term performance of this bioventing system. Weekly system checks will be performed by Mountain Home AFB personnel. If required, major maintenance of the blower unit will be performed by ES-Denver personnel. Detailed blower system information and a maintenance schedule will be included in the operation and maintenance (O&M) manual provided to the base. More detailed information regarding the test procedures can be found in the protocol document.

4.0 EXCEPTIONS TO PROTOCOL PROCEDURES

The procedures that will be used to measure the air permeability of the soil and *in situ* respiration rates are described in Sections 4 and 5, respectively, of the protocol document (Hinchee et al., 1992). No exceptions to the protocol are anticipated at ST-38.

5.0 BASE SUPPORT REQUIREMENTS

5.1 Test Preparation

The following base support is needed prior to the arrival of the drilling subcontractor and the ES pilot test team:

- Assistance in obtaining drilling and digging permits.

- Confirmation of available power source, including 230-volt, 30-amp, single-phase service and a breaker box with one 230-volt receptacle and two 110-volt receptacles located near the north corner of Building 1305. Electrical wiring will conform to the NEC and base electrical codes for hazardous locations.

- Provision of any paperwork required to obtain gate passes and security badges for approximately two ES employees, two drillers, and an electrician (if a base electrician is not available). Vehicle passes will be needed for one ES truck and trailer, and a drill rig and supply truck.

During the initial testing, the following base support is needed:

- Twelve square feet of desk space and a telephone in a building located as close to the site as practical.

- The use of a facsimile machine for transmitting 15 to 20 pages of test results.

- A decontamination area where the driller can clean augers between borings.

- Acceptance of responsibility for drill cuttings from VW and MP borings, including any drum sampling to determine hazardous waste status.

During the 1-year extended pilot test, base personnel will be required to perform the following activities:

- Check the blower system once per week to ensure that it is operating and to record the air injection pressure. ES will provide a brief training session on this procedure.

- If the blower stops working, notify Mr. John Hall (303) 244-8829 or Mr. Doug Downey (303) 831-8100 of ES; or Mr. James Gonzales (AFCEE) at (512) 536-4331.

- Arrange site access for an ES technician to conduct an situ respiration test at approximately 6 months after the initial pilot test, and to conduct soil sampling and respiration testing approximately 1 year after the initial pilot test.

6.0 PROJECT SCHEDULE

The following schedule is contingent upon approval of this pilot test work plan and completion of base support requirements.

Event	Date
Draft Test Work Plan to AFCEE/Mountain Home AFB	21 June 1994
Begin Initial Pilot Test	7 July 1994
Interim Results Report	29 September 1994
6-Month Respiration Test	January 1994
Final Respiration Test	July 1994

7.0 POINTS OF CONTACT

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Fax (303) 831-8208

8.0 REFERENCES

Engineering-Science, Inc. 1992. *Field Sampling Plan for AFCEE Bioventing.* Denver, Colorado.

Hinchee, R.E., Ong, S.K., Miller, R.N., Downey, D.C., Frandt, R. 1992. *Test Plan and Technical Protocol for a Field Treatability Test for Bioventing.* January.

Woodward-Clyde Federal Services. 1994. *Predraft RI Report Information for the POL Yard at Mountain Home AFB, Idaho.*

PART II
DRAFT INTERIM PILOT TEST RESULTS REPORT FOR POL YARD AREA 3, SITE ST-38 MOUNTAIN HOME AFB, IDAHO

OCTOBER 1994

Prepared for:

Air Force Center for Environmental Excellence
Brooks AFB, Texas

and

366 CES/CEV
Mountain Home AFB, Idaho

Prepared by:

Engineering-Science, Inc.
1700 Broadway, Suite 900
Denver, Colorado 80290

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PART II

DRAFT INTERIM PILOT TEST RESULTS REPORT FOR POL YARD AREA 3, SITE ST-38 MOUNTAIN HOME AFB, IDAHO

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FIGURES

PART II

DRAFT

INTERIM PILOT TEST RESULTS REPORT FOR SITE ST-38, POL YARD AREA 3 MOUNTAIN HOME AFB, IDAHO

Initial bioventing pilot tests were completed by Engineering-Science, Inc. (ES) at the Petroleum, Oils, Lubricants (POL) Yard Area 3 (Site ST-38) at Mountain Home Air Force Base (AFB), Idaho during the period of July 7 through 11, 1993. The purpose of this Part II report is to describe the results of the initial pilot tests at Site ST-38 and to make specific recommendations for extended testing to determine the long-term impact of bioventing on site contaminants. Descriptions of the history, geology, and contamination at Site ST-38 are contained in Part I, the Bioventing Pilot Test Work Plan.

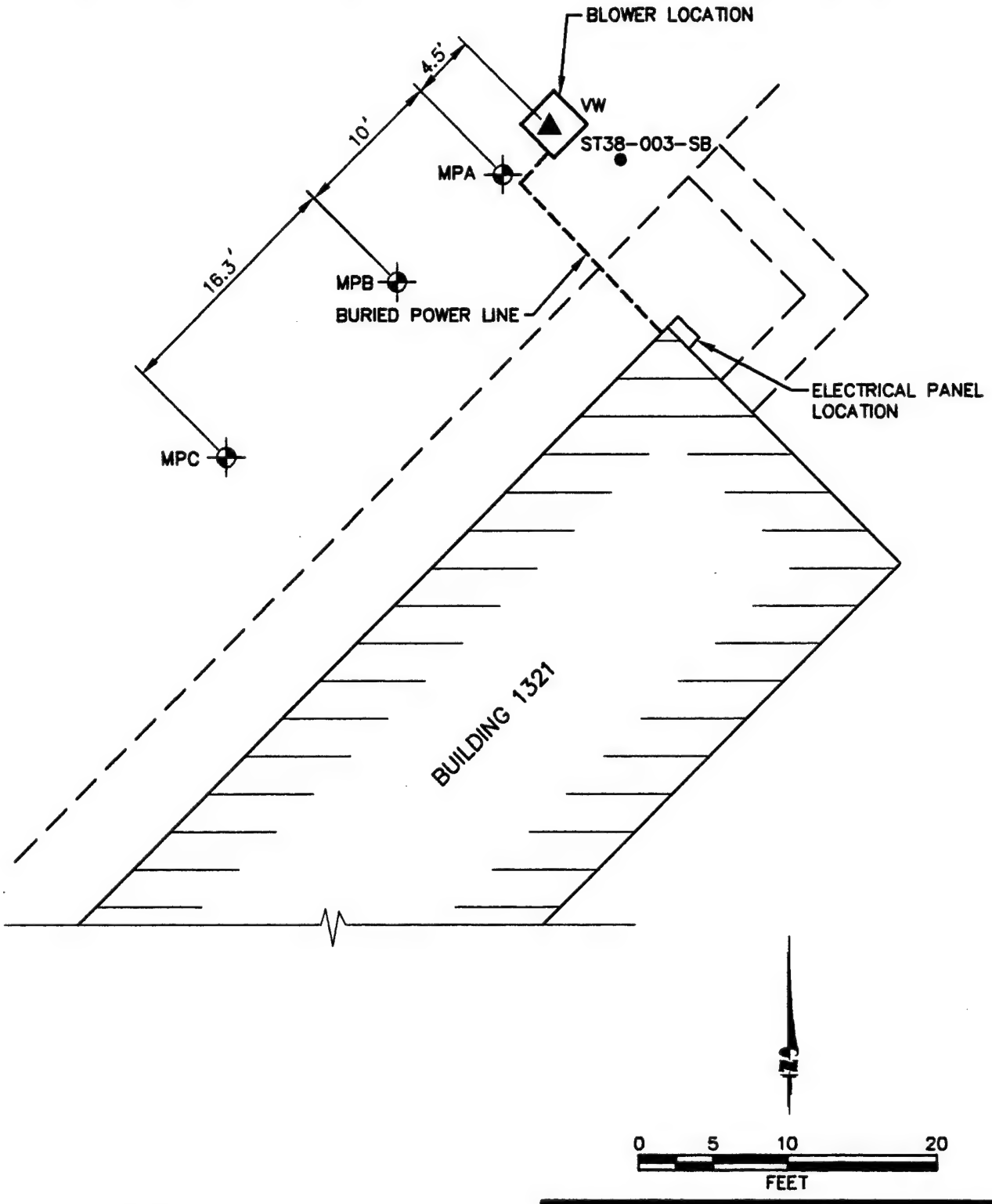
1.0 PILOT TEST DESIGN AND CONSTRUCTION

Pilot testing began with the installation of an air injection vent well (VW) and four vapor monitoring points (MPs). Drilling services were provided by R. P. Jones Drilling Company of Boise, Idaho, and well installation and soil sampling was directed by Mr. John Hall, the ES site manager. Electrical services were provided by Mountain Home AFB.

One VWs, four MPs, and a blower unit were installed at Area 3. The location of the blower unit was changed slightly from that proposed in the work plan to facilitate the installation of electrical power to the blower. Figures 1.1 and 1.2, respectively, depict the locations of and hydrogeologic cross section for the VWs and MPs completed at the site. Boring logs for the MPs and VWs are included in Appendix A. The background MP (MPD) for this site was installed 1,000 feet northeast of Area 3 in uncontaminated soils. The following sections describe the final design and installation of the bioventing systems at Site ST-38.

1.1 Air Injection Vent Well

The air injection VW was installed following procedures described in the Air Force Center for Environmental Excellence (AFCEE) bioventing protocol document (Hinchee et al., 1992). Figure 1.3 shows construction details for the VW. The VW was installed in highly contaminated soils, with the effective screened interval extending from 4 to 18 feet below ground surface (bgs). The actual screened interval was from 5 to 18 feet below ground surface (bgs), but to decrease short-circuiting of the injected air to the ground surface, the top 1 foot of screen was sealed by placing bentonite in the anular space. The VW was constructed using 4-inch-diameter, Schedule 40 polyvinyl chloride (PVC) casing, with a 15-foot interval of 0.02-inch-slotted PVC screen. The annular space between the well casing and borehole was filled with 6-9 silica sand from the bottom of the borehole to approximately 1 foot below the top of the well screen. Granular bentonite was placed above the sand, hydrated in place with potable water, and overlaid with a



LEGEND

ST38-003-SB ● EXISTING SOIL BOREHOLE LOCATION

APPROXIMATE LOCATION OF BURIED JP-4 PIPELINE

▲ VENT WELL LOCATION

⊕ MONITORING POINT LOCATION

FIGURE 1.1

AS-BUILT VENT WELL, MONITORING POINT, AND BLOWER LOCATIONS SITE ST-38, AREA 3

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

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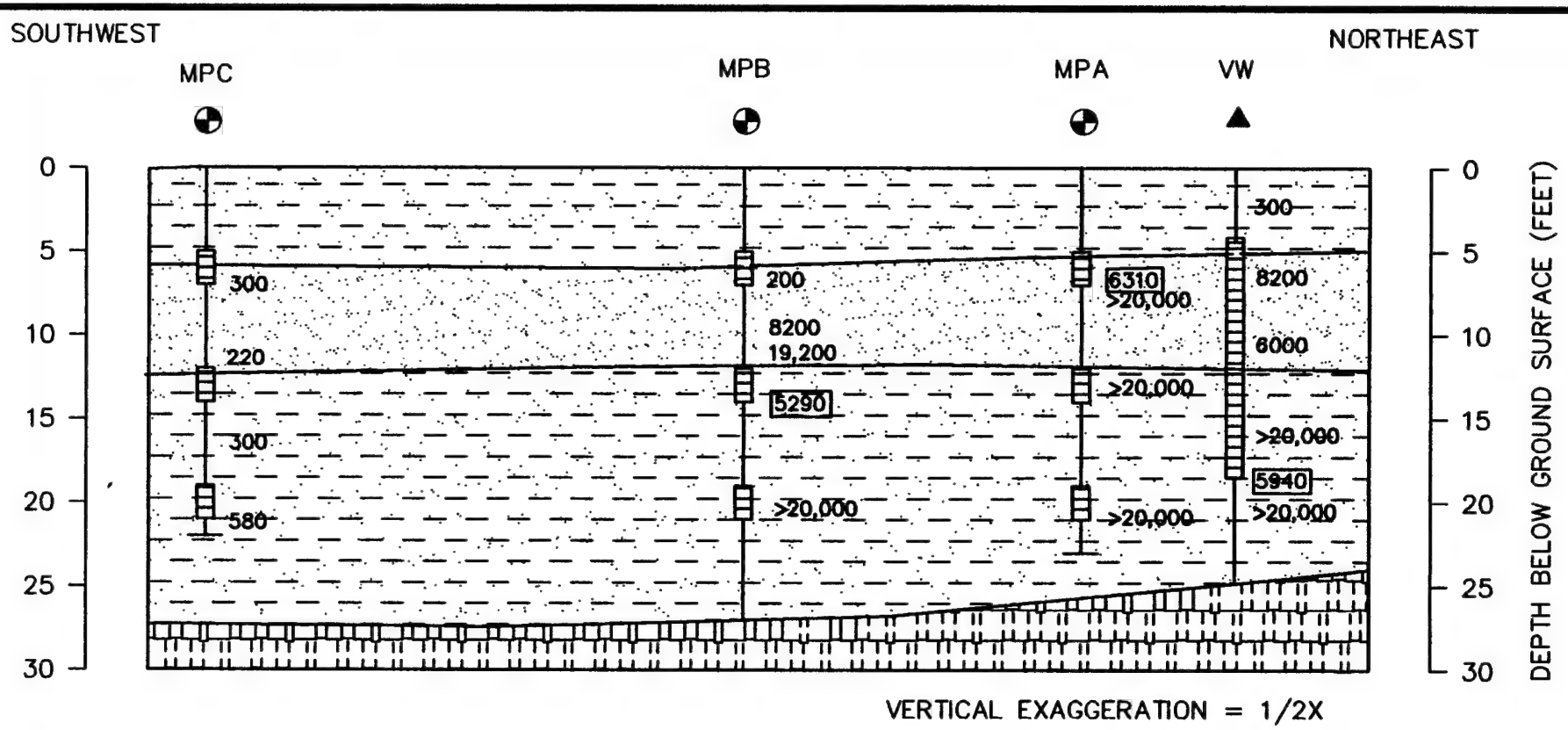


LITHOLOGIC DESCRIPTION

SANDY SILT

SILTY SAND

BASALT BEDROCK

LEGEND

MONITORING POINT

INJECTION VENT WELL

8200 FIELD SCREENING RESULTS FOR TOTAL VOLATILE HYDROCARBONS (ppmv)

6310 LABORATORY RESULTS FOR SOIL TOTAL PETROLEUM HYDROCARBONS (mg/kg)

SCREENED INTERVAL

FIGURE 1.2

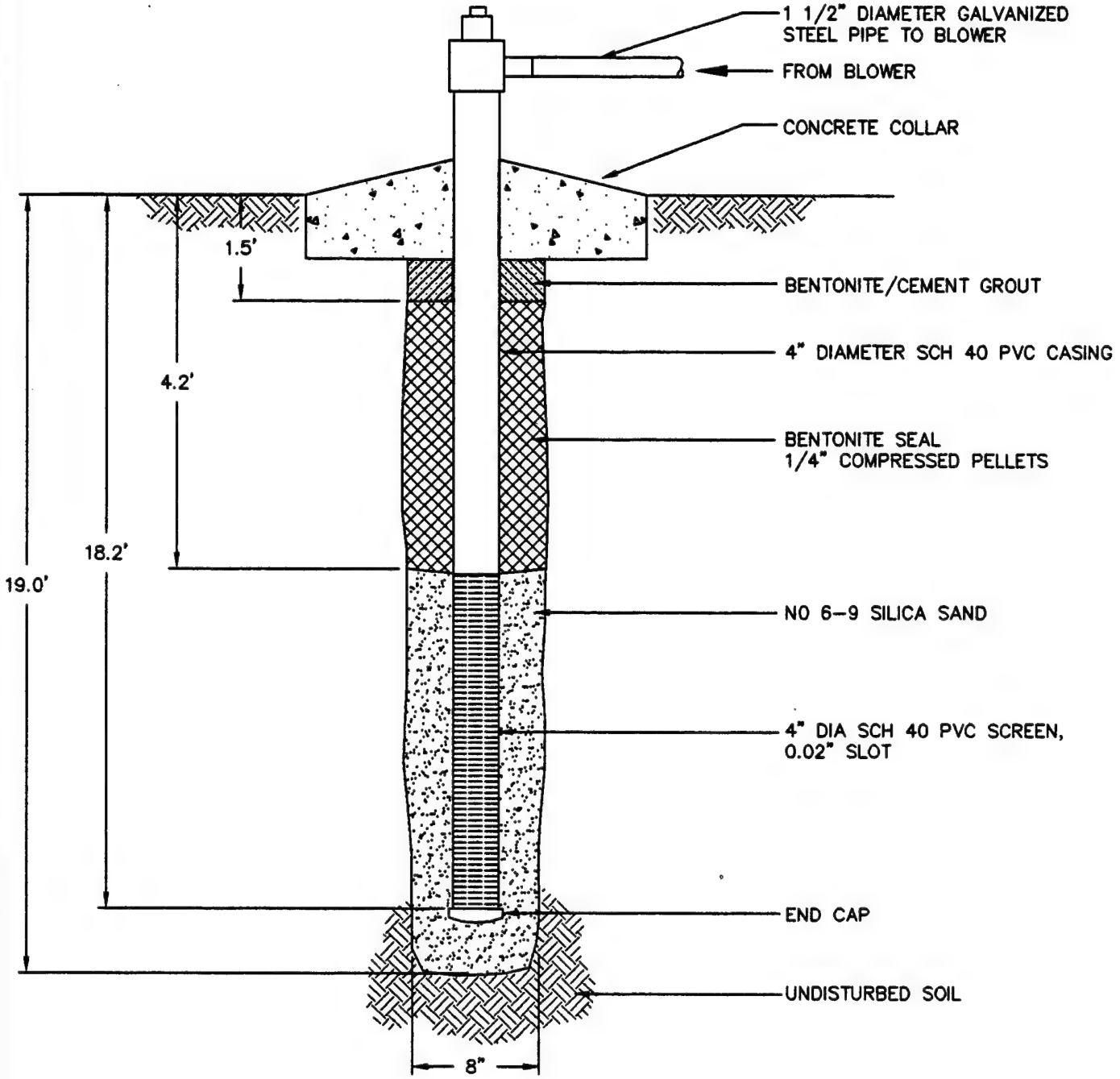
GEOLOGIC CROSS SECTION
SITE ST-38, AREA 3

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

94DN1087 9/03/94



NOT TO SCALE

FIGURE 1.3

AS-BUILT INJECTION VENT WELL CONSTRUCTION DETAIL SITE ST-38, AREA 3

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

cement/bentonite grout seal. The top of the well was completed with a 4-inch-diameter PVC tee with a screw cap.

1.2 Monitoring Points

The MP screens were installed at the depths listed on Table 1.1. The three multidepth MPs (MPA, MPB, and MPC) at this site and the background MP (MPD) were constructed as shown in Figure 1.4. Each was constructed using 6-inch sections of 1-inch-diameter PVC well screen with 0.25-inch-diameter PVC riser pipes extending to the ground surface. At the top of each riser, a ball valve and a 3/16-inch hose barb was installed. The top of each MP was completed with a flush-mounted metal well protector set in concrete. Thermocouples were installed at the 6- and 19-foot depths at MPA to measure soil temperature variations.

The background MP is was installed aproximately 1,000 feet northeast of the pilot test area near the west corner of Building 1297. This well is located in an uncontaminated area and is screened at 7 and 14 feet bgs.

1.3 Blower Unit

A 1-horsepower Gast® regenerative blower unit was used at Site ST-38 for both the initial and extended pilot tests. The blower is energized by 230-volt, single-phase, 30-amp line power from an existing distribution panel located inside Building 1321 (Figure 1.1). The pilot test blower was configured to inject approximately 20 and 10 standard cubic feet per minute (scfm) for the initial and extended pilot tests, respectively.). The final blower wiring was completed by the base and the system was started on 17 August 1994. The configuration, instrumentation, and specifications for the initial pilot test and extended pilot test units are shown on Figure 1.5 of the work plan (Part I). Prior to departing from the site, ES engineers provided an operations and maintenance (O&M) briefing checklist and blower maintenance manual to base personnel. A copy of the checklist is provided in Appendix B.

2.0 PILOT TEST SOIL AND SOIL GAS SAMPLING RESULTS

2.1 Sampling Results

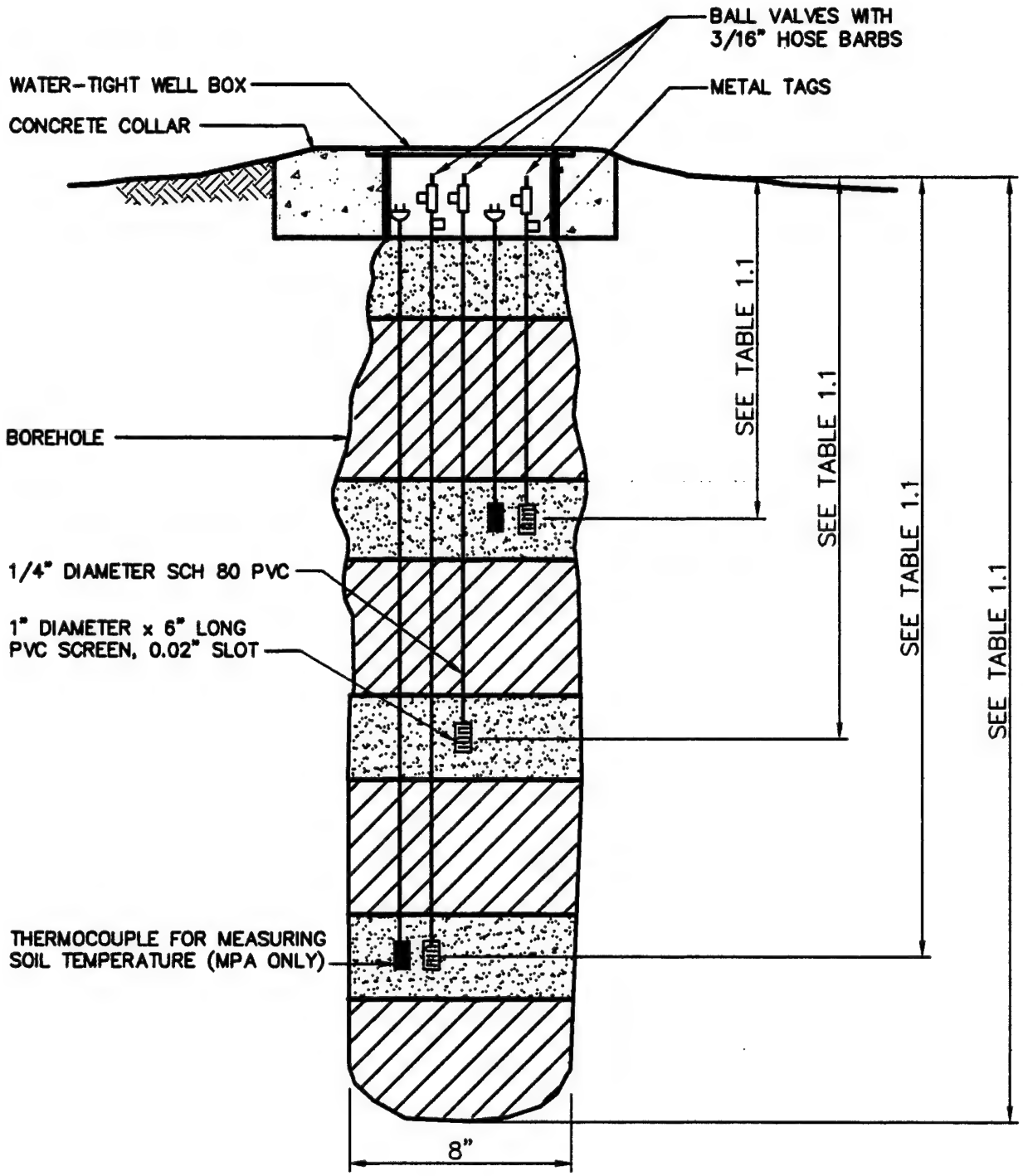
Soils at this site consist predominantly of slightly clayey silt overlying basalt bedrock (Figure 1.2). Layers of sandy and gravely silt were encountered at depths between approximately 6 and 15 feet bgs, and thin layers of caliche were observed at depths below 15 feet. The basalt bedrock surface occurs at depths between approximately 23 and 27 feet bgs at the site. Groundwater was not encountered in the VW or MP boreholes. Boring logs for the MPs and VWs are included in Appendix A.

Hydrocarbon-contaminated soils at this site were encountered beginning at depths ranging from 4 feet bgs in the VW borehole to 15 feet bgs in the MPC borehole and extended to the the total depth of the boreholes. Contaminated soils were identified based on odor, staining, presence of liquid-phase fuel, and headspace volatile organic compound (VOC) field screening results. Contaminated soils were encountered in the VW and all

TABLE 1.1
WELL CONSTRUCTION SUMMARY
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

Location	Date Completed	Total Borehole Depth (feet bgs) [a/]	Screened Interval (feet bgs)
VW	7/7/94	20	4-18
MPA	7/7/94	22	6, 13, 19
MPB	7/8/94	27	6, 13, 19, 25
MPC	7/8/94	22	7, 13, 19
MPD	7/8/94	16	7,14

[a/] bgs = below ground surface



LEGEND

BENTONITE SEAL

6-9 SILICA SAND

FIGURE 1.4

TYPICAL AS-BUILT MONITORING POINT CONSTRUCTION DETAIL SITE ST-38, AREA 3

Mountain Home AFB, Idaho

ENGINEERING-SCIENCE, INC.

Denver, Colorado

MP boreholes, with the greatest contamination occurring in the VW. Soils at these locations had a strong hydrocarbon odor, and layers of soil saturated with JP-4 fuel were encountered at depths below approximately 20 feet bgs. Fuel (without any water) was extracted from the MPB 25-foot-depth screened interval. The extracted fuel sample was analyzed by Mountain Home AFB and met the specifications for JP-4 fuel.

Soil samples for laboratory analysis were collected from split-spoon samplers with 2-inch-diameter brass liners. Soil sample headspace was screened for VOCs using a photoionization detector (PID) to determine the presence of contamination and to select soil samples for laboratory analysis. Soil samples for laboratory analysis were collected from depths of 7, 14, and 18 feet from the VW, MPA, and MPB boreholes, respectively. A background soil sample was collected from MPD at a depth of 7 feet bgs. Soil gas samples for laboratory analyses were collected by extracting soil gas from the completed VW, and at depths of 6 feet from MPA and 13 feet from MPC.

Soil samples were shipped via Federal Express® to the Pace, Inc. laboratory in Huntington Beach, California for chemical and physical analysis. Soil samples were analyzed for total recoverable petroleum hydrocarbons (TRPH); benzene, toluene, ethylbenzene and xylenes (BTEX); iron; alkalinity; total Kjeldahl nitrogen (TKN); and several physical parameters. The background soil sample was analyzed only for TKN and other physical parameters. Soil gas samples were shipped via Federal Express® to Air Toxics, Inc. in Folsom, California for total volatile hydrocarbon (TVH) and BTEX analysis. The results of these analyses are provided in Table 2.1.

2.2 Exceptions To Test Protocol Document Procedures

Procedures described in the protocol document (Hinchee et al., 1992) were used to complete all treatability tests at Site ST-38.

3.0 PILOT TEST RESULTS

3.1 Initial Soil Gas Chemistry

Prior to initiating any air injection, the VW and all MPs were purged until oxygen levels had stabilized, and initial oxygen, carbon dioxide, and TVH concentrations were sampled using portable gas analyzers, as described in the technical protocol document (Hinchee et al., 1992). At the VW and all MPA and MPB screened interval depths, microorganisms had depleted soil gas oxygen concentrations to below 1.5 percent, indicating significant biological activity and soil contamination. Initial oxygen concentrations at MPC ranged from 8.6 to 10.0 percent, probably as a result of less fuel contamination (and therfore less biological activity). In comparison, the soils at the backgrtound MP (MPD) were not contaminated and had soil gas oxygen concentrations of 19.6 and 18.4 percent. Table 3.1 summarizes the initial soil gas chemistry.

3.2 Air Permeability

An air permeability test was conducted according to protocol document procedures. Air was injected into the VW for 1 hour at a rate of approximately 20 scfm and an average

TABLE 2.1
SOIL AND SOIL GAS ANALYTICAL RESULTS
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

Analyte (Units)[a/]	Sample Location-Depth (feet below ground surface)			
Soil Gas Hydrocarbons	VW-18	MPA-6	MPC-13	MPD-7
Benzene (ppmv)	1,100	540	22	-----[b/]
Ethylbenzene (ppmv)	36	39	0.6	-----
Toluene (ppmv)	1,000	680	3.6	-----
Xylenes (ppmv)	360	440	3.6	-----
TVH (ppmv)	130,000	60,000	10,000	-----
Soil Hydrocarbons	VW-18	MPA-7	MPB-14	MPD-7
TRPH (mg/kg)	5,940	6,310	5,290	-----
Benzene (mg/kg)	130	60	61	-----
Toluene (mg/kg)	660	350	300	-----
Ethylbenzene (mg/kg)	110	72	64	-----
Xylenes (mg/kg)	1,210	840	740	-----
Soil Inorganics	VW-18	MPA-7	MPB-14	MPD-7
pH (pH units)	8.6	7.8	8.2	-----
Iron (mg/kg)	27,900	16,600	22,700	17,200
Alkalinity (mg/kg as $CaCO_3$)	1,060	1,040	220	6,190
TKN (mg/kg)	70	64	82	89
Phosphates (mg/kg)	ND[c/]	ND	ND	ND
	VW-18	MPA-7	MPB-14	MPD-7
Moisture (% wt.)	17.5	15.5	18.0	11.7
Gravel (%)	4.2	2.7	0.6	3.1
Sand (%)	51.4	56.6	41.3	77.5
Silt (%)	36.0	31.8	45.4	12.3
Clay (%)	8.4	8.6	12.7	7.1

a/ mg/kg=milligrams per kilogram; ppmv=parts per million, volume per volume; $CaCO_3$=calcium carbonate; TKN=total Kjeldahl nitrogen; TVH=total volatile hydrocarbons; TRPH=total recoverable petroleum hydrocarbons; wt.=weight; °F = degrees Fahrenheit

b/ ----- = Not analyzed

c/ ND=not detected

TABLE 3.1
INITIAL SOIL GAS CHEMISTRY
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

Sample Location	Screen Depth (feet)	O_2 (%)	CO_2 (%)	TVH (ppmv) [a/]	TPH (mg/kg) [b/]	Moisture (%) [c/]
VW	4-18	0.0	9.6	>20,000	5,940	17.5
MPA	6	0.1	19.0	>20,000	6,310	15.5
MPA	13	0.0	4.6	>20,000	-----	-----
MPA	19	0.2	3.8	>20,000	-----	-----
MPB	6	1.5	13.9	8,800	-----	-----
MPB	13	0.6	10.0	>20,000	5,290	18.0
MPB	19	1.0	5.6	>20,000	-----	-----
MPB	25	1.1	9.5	>20,000	-----	-----
MPC	7	8.6	2.8	540	-----	-----
MPC	13	10.0	0.5	10,000	-----	-----
MPC	19	9.8	0.1	>20,000	-----	-----
MPD	7	19.6	1.4	240	-----	-----
MPD	14	18.4	2.0	260	-----	-----

[a/] Total volatile hydrocarbon field screening results reported in parts per million, volume per volume.

[b/] Laboratory total petroleum hydrocarbon analytical results referenced to jet fuel (MW-156).

[c/] ----- = not analyzed.

TABLE 3.2
MAXIMUM PRESSURE RESPONSE
AIR PERMEABILITY TEST
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

Location	Distance From VW (feet)	Screen Depth (feet bgs)	Elapsed Time to Maximum Pressure (minutes)	Maximum Pressure response (inches of water)
MPA	4.5	6	18	3.0
		13	14	5.0
		19	26	2.3
MPB	14.5	6	14	1.25
		13	26	1.85
		19	26	1.60
		25	18	1.50
MPC	30.8	7	30	0.87
		13	30	1.00
		19	30	1.20

pressure of 8.5 inches of water. The maximum pressure response at each MP is listed in Table 3.2. The pressure measured at the MPs increased rapidly during the first 5 to 15 minutes of the test, then at a much slower rate for the remainder of the test. Due to the rapid pressure response, the steady-state method of determining air permeability was selected. A soil gas permeability value of 16 darcys, typical for sandy silt, was calculated for this site. A radius of pressure influence of at least 30 feet was observed at all depths. At MPC, the farthest MP from the VW, the maximum pressure response ranged between 0.87 inches of water at the 6-foot depth to 1.20 inches of water at the 19-foot depth.

3.3 Oxygen Influence

The depth and radius of oxygen increase in the subsurface resulting from air injection period into the VW during pilot testing is the primary design parameter for full-scale bioventing systems. Optimization of full-scale and multiple VW systems requires pilot testing to determine the volume of soil that can be oxygenated at a given flow rate and VW screen configuration.

Table 3.3 presents the change in soil gas oxygen levels that occurred during a 24-hour injection period using the extended pilot test blower unit. This period of air injection produced increases in soil gas oxygen levels at all depths in MPA, MPB, and MPC. Based on measured changes in oxygen levels, it is anticipated that the radius of influence for a long-term bioventing system at this site will exceed 30 feet at all depths using an injection rate of 10-20 scfm. Monitoring during the extended pilot test at this site will better define the effective treatment radius.

3.4 *In Situ* Respiration Rates

The *in situ* respiration test was performed by injecting a mixture of air (oxygen) and approximately 4-percent helium (inert tracer gas) into the VW and three MP screened intervals (MPA-6, MPA-19, and MPB-13) for a 20-hour period. Oxygen loss and other changes in soil gas composition over time were then measured at these intervals and all other MP intervals which had elevated oxygen levels following air injection. Oxygen, TVH, carbon dioxide, and helium were measured for a period of approximately 2 days following air injection. The measured oxygen losses were then used to calculate biological oxygen utilization rates. The results of *in situ* respiration testing for the VW, MPA-6, MPA-19, and MPB-13 are presented in Figures 3.1 through 3.4, respectively. Table 3.4 provides a summary of the oxygen utilization and fuel degradation rates.

Because helium is a conservative, inert gas, the change in helium concentrations over time can be useful in determining the effectiveness of the bentonite seals between MP screened intervals. Figures 3.1 through 3.4 compare oxygen utilization and helium retention. Because the observed helium losses were negligible, and because helium will diffuse approximately three times faster than oxygen due to oxygen's greater molecular weight, the measured oxygen loss is the result of bacterial respiration and not due to diffusion or faulty MP construction.

During the respiration test it was noticed that the helium meter was apparently not operating properly, possibly due to high ambient temperatures. Helium concentration

TABLE 3.3
INFLUENCE OF AIR INJECTION AT VENT WELL
ON MONITORING POINT OXYGEN CONCENTRATIONS
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

Location	Distance From VW (feet)	Screen Depth (feet bgs)	Initial O_2 [a/] (%)	Final O_2 [b/] (%)
MPA	4.5	6	0.1	20.6
		13	6.0	20.2
		19	13.9	20.2
MPB	14.5	6	0.2	15.7
		13	3.2	19.3
		19	2.4	16.8
		25	0.5	10.1
MPC	30.8	7	2.0	11.2
		13	0.0	3.5
		19	0.0	3.5

[a/] Readings taken following respiration test.

[b/] Readings taken following approximately 24 hours of air injection at the VW.

FIGURE 3.1
RESPIRATION TEST OXYGEN AND HELIUM CONCENTRATIONS FOR VW
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

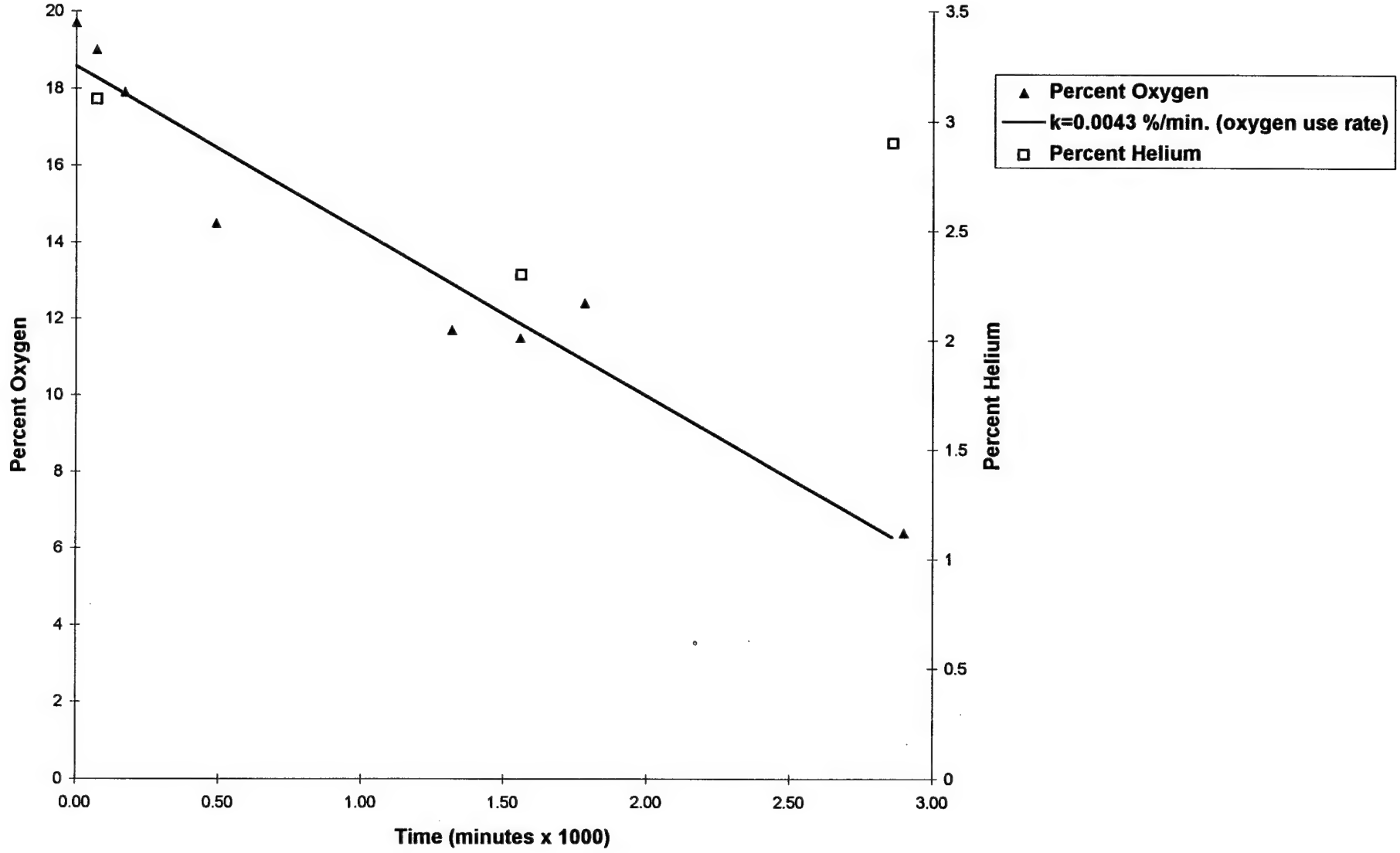


FIGURE 3.2
RESPIRATION TEST OXYGEN AND HELIUM CONCENTRATIONS FOR MPA-6
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

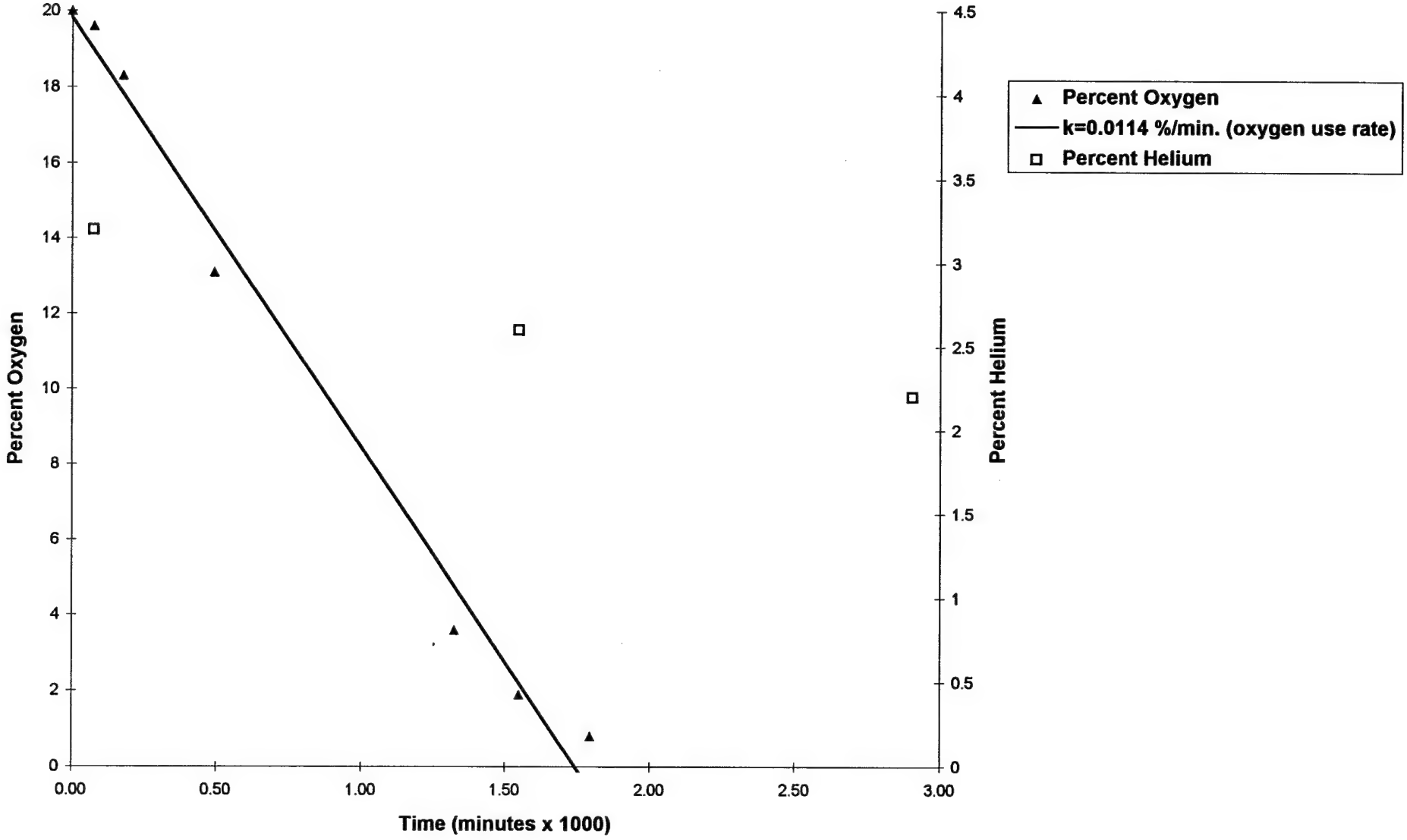


FIGURE 3.3
RESPIRATION TEST OXYGEN AND HELIUM CONCENTRATIONS FOR MPA-19
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

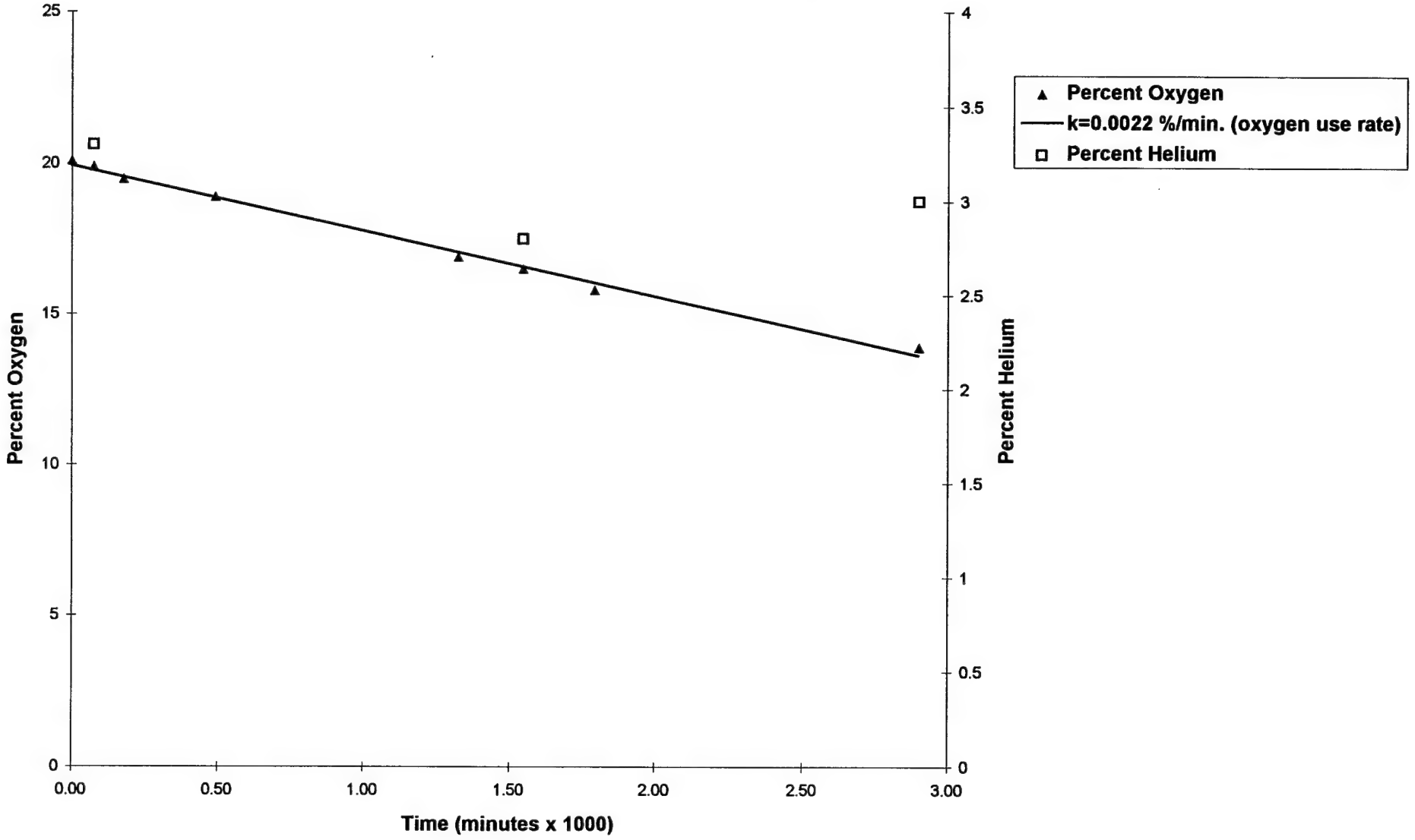


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FIGURE 3.4
RESPIRATION TEST OXYGEN AND HELIUM CONCENTRATIONS FOR MPB-13
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

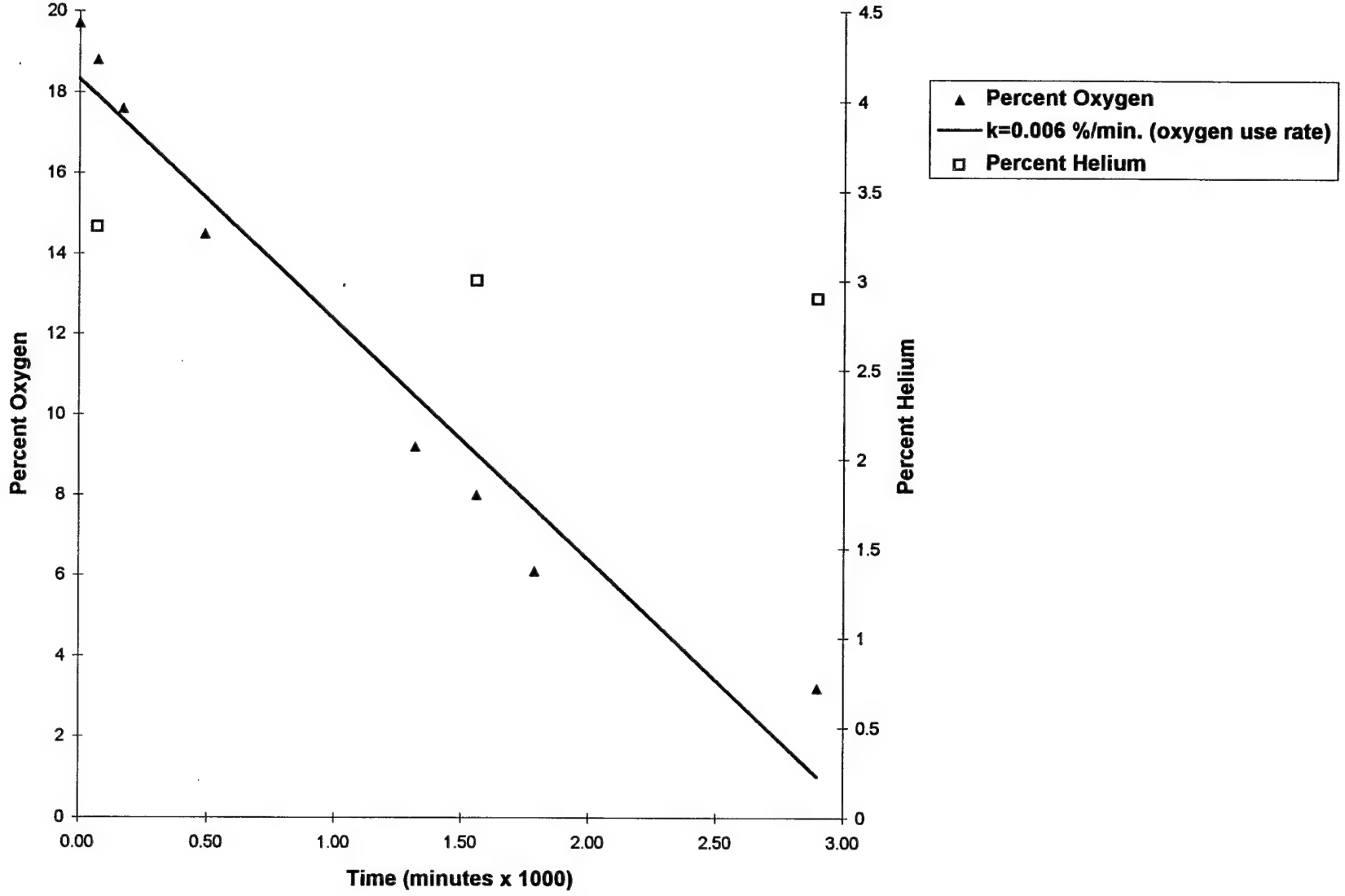

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TABLE 3.4

OXYGEN UTILIZATION AND FUEL DEGRADATION RATES
SITE ST-38, AREA3
MOUNTAIN HOME AFB, IDAHO

Location-Depth	0_2 Loss [a/] (%)	Test Duration (minutes)	O_2 Utilization Rate (%/minute)	Fuel Degradation Rate (mg TPH/year) [b/]
VW	12.3	2860	0.0043	1020
MPA-6	20.4	1790	0.0114	2960
MPA-13	13.1	2910	0.0045	1010
MPA-19	6.4	2900	0.0022	500
MPB-13	17.4	2900	0.0060	1350
MPB-19	11.6	2900	0.0040	900

a/ Values based on best-fit lines (Figures 3.1 through 3.4).

b/ mg TPH/year = milligrams of total petroleum hydrocarbons per kilogram of soil per year.

measurements were consistently higher in the morning when the ambient temperatures were relatively low, and lower in afternoon when the ambient temperatures exceeded 100 degrees Fahrenheit. Because of the apparent changes in helium concentration readings with changes in ambient temperature, only the helium measurements taken between approximately 1100 and 1300 each day were used to analyze changes in helium concentrations..

Results from this test indicate significant soil contamination at all depths below 7 feet in MPA and MPB. Soil samples collected from the VW at a depth of 18 feet, from MPA at a depth of 7 feet, and from MPB at a depth of 14 feet had TRPH concentrations of 5,940, 6,310, and 5,290 milligrams per kilogram (mg/kg), respectively. Initial oxygen concentrations measured in the soil gas collected from the VW and all depths at MPA and MPB, were no greater than 1.5 percent, indicating high biological activity associated with the contamination. Soils at MPC (the farthest MP from the suspected source of contamination) were less contamianted as indicated by lower soil gas TVH, and higher soil gas oxygen concentrations (Table 3.1).

Oxygen loss measured at MPA, MPB, and the VW occurred at moderate to high rates, ranging from 0.0022 percent per minute at MPA-19 to 0.0114 percent per minute at MPA-6. At MPA-6, the oxygen dropped from 20.0 percent to 0.8 percent in 1,790 minutes.

Based on these oxygen utilization rates, an estimated 500 to 2,960 mg of fuel per kg of soil can be degraded each year at this site. This conservative estimate is based on an average air-filled porosity of approximately 0.12 liter per kg of soil, and a ratio of 3.5 mg of oxygen consumed for every 1 mg of fuel biodegraded. Actual degradation rates may exceed these estimates.

3.5 Potential Air Emissions

The long-term potential for air emissions from full-scale bioventing operations at this site is low. Emissions should be minimal because accumulated vapors will move slowly outward from the air injection VWs and will be biodegraded as they move horizontally through the soil.

The air in pumphouse Building 1321 was monitored for TVH vapors both before and during air injection to confirm that TVH emissions are not entering the building as the result of injection at the VW. Building air sampling results are presented in Table 3.5. The monitoring results indicate that air injection will not create health or explosion hazards. Additionally, exhaust fans (not in operation during periods of air monitoring) inside the building are used to prevent the accumulation of harmful concentrations of vapors. The vapors measured both before and after air injection apear to be the result of fuel pumping and fuel truck loading operations.

4.0 RECOMMENDATIONS

Initial bioventing tests at this site indicate that oxygen has been depleted in the contaminated soils, and that air injection is an effective method of increasing aerobic fuel

TABLE 3.5

AIR MONITORING RESULTS FOR BUILDING 1321
SITE ST-38, AREA 3
MOUNTAIN HOME AFB, IDAHO

Location	Range of Breathing Zone TVH (ppmv) [a/]
Before Air Permeability Test	
Office	0 - 88
Pumphouse	8 - 68
During Air Permeability Test	
Office	0 - 76
Pumphouse	0 - 96

a/ TVH (ppmv) = Total volatile hydrocarbons, parts per million, volume per volume.

biodegradation. AFCEE has recommended that air injection continue at this site to determine the long-term radius of oxygen influence and the effect of time, available nutrients, and changing temperatures on fuel biodegradation rates.

A small, 1-horsepower regenerative blower has been installed at the site to continue air injection at a rate of approximately 10 scfm. In January 1995, ES will return to the site to sample and analyze the soil gas and conduct a repeat respiration test. In July 1995, a final respiration test will be conducted, and soil and soil gas samples will be collected from the site to determine the degree of remediation achieved during the first year of *in situ* treatment.

5.0 REFERENCES

Hinchee, R.E., S.K. Ong., R.N. Miller, D.C. Downey, and R. Frandt. 1992. *Test Plan and Technical Protocol for a Field Treatability Test for Bioventing.* Prepared for USAF Center for Environmental Excellence. May.

APPENDIX A
GEOLOGIC BORING LOGS, CHAIN-OF-CUSTODY FORMS, TEST DATA, AND CALCULATIONS

GEOLOGIC BORING LOG

BORING NO. VW
CLIENT:
JOB NO.: 722408.57
LOCATION: Mt. Home AFB
GEOLOGIST: JFH
COMMENTS:

CONTRACTOR: R. Jones Drilling
RIG TYPE:
DRLG METHOD: HSA
BORING DIA.: 11"
DRLG FLUID —

DATE SPUD: 7/6/94 14:15
DATE CMPL: 7/7/94 15:30
ELEVATION:
TEMP.: upper 90's
WEATHER: windy, p cloudy

Elev. (ft.)	Depth (ft.)	Pro-file	US CS	Geologic Description	Samples No.	Samples Depth (ft)	Sample Type	Penet. Res.	Remarks TIP = Bkgrnd/Reading (ppm)
	1			6" gravel @ surface					Background H2O* = 30 (60)
	2			SILT, md brn, tr-sm sand					2-4' 150 (300) ppm
	3			moist no odor	G				
	4								
	5			SILT, gray, fuel odor, moist		5-7		12	
					D			20	14:30
				SAND, md brn, f-m, moist				17	
				fuel odor				17	45 = (4100) 8200
				becoming finer-grained w/ depth					
	10								
	11			SAND, to SAND & GRAVEL up to		10-12		10	14:50
	12			~1"Ø, moist, fuel odor	D			7	
				md brn				3	HS = (3000) 6000
				SILT, tr-sm sand & gSILT, lt-md				8	
	15			brn fuel odor moist					
				SAA - w/ lg gravel >2"Ø		15-17		32	15:05
				16' caliche (strong odor, wet)	D			36	
				SAA - no gravel				40+	(15-17) HS = >10,000 (20,000)
					D	18-20 To lab		16	15:25
	20							50+	(18-20) HS = >10,000 (20,000)
									TD = 19' 15:30
	25								
	30								

al – slight
tr – trace
sm – some
& – and
@ – at
w – with

v – very
lt – light
dk – dark
bf – buff
brn – brown
blk – black

f – fine
m – medium
c – coarse
BH – Bore Hole
SAA – Same As Above

SAMPLE TYPE
D – DRIVE
C – CORE
G – GRAB

C Core recovery
Core lost

Water level drilled

ENGINEERING-SCIENCE

* Background H_2O = ~10 cm³ of water placed in bag to mimic moisture interference.
All Sample Headspaces taken from ziplac after settling 15 minutes in the sun.

GEOLOGIC BORING LOG

BORING NO. MPA | CONTRACTOR: Jones | DATE SPUD: 7/7/94 16:30
CLIENT: | RIG TYPE: | DATE CMPL: 7/7/94
JOB NO.: 722408.57 | DRLG METHOD: HSA | ELEVATION:
LOCATION: Mt. Home AFB | BORING DIA.: 8" | TEMP.: ~90°F
GEOLOGIST: JFH | DRLG FLUID | WEATHER: Sunny
COMMENTS:

Elev. (ft.)	Depth (ft.)	Pro-file	US CS	Geologic Description	Samples No.	Samples Depth (ft)	Sample Type	Penet. Res.	Remarks TIP = Bkgrnd/Reading (ppm)
	1			Gravel					
				SILT, tr sand & clay mod brn					
				sl gray stain, moist					
				SILT, sm sand to SILT & SAND					
	5			brn changing to gray w/ depth					
				moist fuel odor	D	5-7 to lab		5	16:50
				SILT, tr SM sand, gray, moist				12 18	(5-7) HS = >10,000 (20,000)
				fuel odor				20	
	10			SILT, w/ sand & gravel, gray					
				moist fuel odor					
						12-		10	1708
				SILT, tr-sm sand, md-lt brn	D	14		18 35	(12-14) HS = 210,000 (20,000)
				w/ SM gray stain sl moist					
	15			fuel odor					
				SAA					
				caliche zones					
	20								
				SAA strong odor - saturated		20.5- 22		13 24	
				caliche ~~zones~~ zones - fuel				33 refusal	20-22.5 HS = >10,000 (20,000) TIP
				or water?					
	25								
	30								

al – slight | v – very | f – fine
tr – trace | lt – light | m – medium
sm – some | dk – dark | c – coarse
& – and | bf – buff | BH – Bore Hole
@ – at | brn – brown | SAA – Same As Above
w – with | blk – black

SAMPLE TYPE
D – DRIVE | C Core recovery
C – CORE
G – GRAB | Core lost

Water level drilled

ENGINEERING-SCIENCE

18-20

GEOLOGIC BORING LOG

BORING NO. MPB - | CONTRACTOR: Jones | DATE SPUD: 7/8/94 0840
CLIENT: | RIG TYPE: | DATE CMPL: 7/8/94
JOB NO.: 722408.57 | DRLG METHOD: HSA | ELEVATION:
LOCATION: Mt. Home POL Yard | BORING DIA.: 8" | TEMP.: ~70's
GEOLOGIST: JFH | DRLG FLUID — | WEATHER: Sunny S. breeze
COMMENTS:

Elev. (ft.)	Depth (ft.)	Pro-file	US CS	Geologic Description	Samples No.	Samples Depth (ft)	Sample Type	Penet. Res.	Remarks TIP = Bkgrnd/Reading (ppm)
	1			GRAVEL					
				SILT, tr sand, lt brn, moist, no odor					
	5								
				SILT, sm sand, lt-md brn, moist no odor	D	5-7		5 17 18	0845 HS = (100) 200
	10			fuel odor, gray, moist-v. moist	G	8-12		35	0905 HS = (4100) 8200
				SAA moist strong fuel odor	D	12-14		12 17	0915
				(tr) sm clay		to lab		24 38	HS (1900) 19,200
	15								
	20								
				SILT, brn-gray mottled, calche/Fe in fractures, fuel? in fractures	D	20-		6 11 20 26	HS = (710,000) 30,000
	25			fuel odor basalt fragments					
				Note soil sat. w/ product below ~20'					
				BEDROCK - mixture of water & product mud on spoon		27-27.3"			
	30								

al – slight | v – very | f – fine
tr – trace | lt – light | m – medium
sm – some | dk – dark | c – coarse
& – and | bf – buff | BH – Bore Hole
@ – at | brn – brown | SAA – Same As Above
w – with | blk – black

SAMPLE TYPE
D – DRIVE | C Core recovery
C – CORE
G – GRAB | Core lost

Water level drilled

ENGINEERING-SCIENCE

5-7
12-14 - 106
20-22

Sheet 1 of 1

GEOLOGIC BORING LOG

BORING NO. MPC-1 | CONTRACTOR: R. Jones | DATE SPUD: 7/8/94 11:30
CLIENT: | RIG TYPE: | DATE CMPL: 7/8/94
JOB NO.: 722408.57 | DRLG METHOD: HSA | ELEVATION:
LOCATION: Mt. Home P.O.L. | BORING DIA.: 8" | TEMP.: ~90°
GEOLOGIST: JFH | DRLG FLUID: - | WEATHER: Sunny sl S. breeze
COMMENTS:

Elev. (ft.)	Depth (ft.)	Profile	US CS	Geologic Description	Samples No.	Samples Depth (ft)	Sample Type	Penet. Res.	Remarks TIP = Bkgrnd/Reading (ppm)
	1			GRAVEL					
				SILT, tr-sm sand, lt brn moist no odor					
	5			Asphalt fragments @ ~4'-5'					
				SILT, sand, basalt fragments no recovery	X	5-7		17 22 30	11:44 HS: 150(300)
				SILT, tr-sm sand, v-moist tr-sm clay, no odor					
	10								
				SAND, tr silt, sm gravel moist, m-brn, caliche @ 11'	D	10-12		22 50+	1210 HS= 110(220)
			SILT	v. moist no odor, tr-sm sand hard drilling @ ~13'					
	15								
				SILT - SILT & SAND mel brn moist, sl. odor thin caliche layers	D	15-16		18 40+	13:00 HS = 150(300)
				SILT tr-sm sand, mel brn, moist- v. moist v. sl odor					
	20					20-22		4 14 16 28	HS = 290(580)
				SILT, fr sand, mel-lt brn, 3" caliche @ ~21.5 v. moist-sat above caliche, moist below v. sl odor, Fe-stained fract;					
	25								
	30								

al - slight | v - very | f - fine
tr - trace | lt - light | m - medium
sm - some | dk - dark | c - coarse
& - and | bf - buff | BH - Bore Hole
@ - at | brn - brown | SAA - Same As Above
w - with | blk - black

SAMPLE TYPE
D - DRIVE | C Core recovery
C - CORE
G - GRAB | Core lost

Water level drilled

ENGINEERING SCIENCE

GEOLOGIC BORING LOG

BORING NO. MP 0 - | CONTRACTOR: R. Jones | DATE SPUD: 7/8/94
CLIENT: | RIG TYPE: | DATE CMPL: 7/8/94 1535
JOB NO.: 722408.57 | DRLG METHOD: HSA | ELEVATION:
LOCATION: Mt. Home AFB | BORING DIA.: 8" | TEMP.: up. 90's
GEOLOGIST: RTH | DRLG FLUID — | WEATHER: Sunny
COMMENTS: Background MD

Elev. (ft.)	Depth (ft.)	Pro-file	US CS	Geologic Description	Samples No.	Samples Depth (ft)	Sample Type	Penet. Res.	Remarks TIP = Bkgrnd/Reading (ppm)
	1								
	2			Silt, Brown, Trace of Sand moist,					
	5							14	
	6			Sand, VF - Medium Brown	1			33	
	7			Silt, some small sand, Light Brown moist - no odor	1	5-7 to lab		<20	HS=(130)260 ppm
	10			SAA					
	11					10-12		29 50+	HS=(110)220 ppm
	12			Fine grained Sand (Fine to Very Fine) Brown - no odor, Little Silt, Moist					
	15							15 50+	
	16			Silt to very Fine sand, moist to wet					HS=(120)240 ppm
	17			Brown, no odor, small gravel bits					
				15'-8" Bedrock					TD 15'-8" 1535
	20								
	25								
	30								

sl - slight | v - very | f - fine
tr - trace | lt - light | m - medium
sm - some | dk - dark | c - coarse
& - and | bf - buff | BH - Bore Hole
@ - at | brn - brown | SAA - Same As Above
w - with | blk - black

SAMPLE TYPE
D - DRIVE C Core recovery
C - CORE
G - GRAB Core lost

Water level drilled

CHAIN OF CUSTODY RECORD

ENGINEERING-SCIENCE, INC.
1700 BROADWAY, SUITE 900
DENVER, COLORADO 80290
303-831-8100

AFCEE BIOVENTING PILOT TESTS

Base: Mt Home ID

Site: POL YARD

ES Job No.
DE268.57.08

Sampler(s): (Signature) T. Hennington

Preservative: NONE | HOLD | AT 4C | NONE

Analysis Required: SW 9045 (PH) | A 403 (ALKA) | SW 7380 (IRON) | SW 846 (MOIST) | SW 8020 (BTEX) | E 418.1 (TRPH) | E 351.2 (TKN) | E 365.3 (PHOS) | UCM (CLASS)

Ship To:

PACE INCORPORATED
5702 Bolsa Ave.
Huntington Beach, CA 92649

Attn: Melony Concepcion
(714) 892-2565

Date	Time	Sample Description	Lab I.D.	No. of Contrs.	Sample Type	Matrix	Remarks
7/5/96	15:00	~~MPD-7~~ MH-MPD-7		1	G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	
					G C	SOIL	

Relinquished by: (Signature)	Date / Time	Recieved for Laboratory by: (Signature)	Date / Time	Remarks:
Todd Hennington	7/11/96 1037			
Relinquished by: (Signature)	Date / Time	Recieved for Laboratory by: (Signature)	Date / Time	G - Grab Sample, C - Composite Sample

Distribution: Original Accompanies Shipment. Copies to: Coordinator Field Files
Federal Express Number:
Airbill Number: 196896187 5

ENGINEERING-SCIENCE, INC.
1700 Broadway, Suite 900 • Denver, Colorado
(303) 831-8100

CCRSOIL

AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630
(916) 985-1000 • FAX (916) 985-1020

CHAIN OF CUSTODY RECORD

PROJECT # 722408.57040 PO # 722408.57 COLLECTED BY (Signature) J. Hall
REMARKS Mt. Home AFB

FIELD SAMPLE I.D.#	SAMPLING MEDIA (Tenax, Canister etc.)	DATE/TIME	ANALYSIS	VAC./PRESSURE	LAB I.D. #
MH-VW	Canister # 11822	7/9/94 12:00	TO-3		
MH-MPA-6	Canister # 12377	7/9/94 12:02	TO-3		
MH-MPC-13	Canister # 12354	7/9/94 12:05	TO-3		

RELINQUISHED BY: DATE/TIME	RECEIVED BY: DATE/TIME	RELINQUISHED BY: DATE/TIME	RECEIVED BY: DATE/TIME
J. Hall / Fed Ex 7/11/94 10:00			

LAB USE ONLY

SHIPPER NAME	AIR BILL #	OPENED BY: DATE/TIME	TEMP(°C)	CONDITION

REMARKS

CHAIN OF CUSTODY RECORD

ENGINEERING-SCIENCE, INC.
1700 BROADWAY, SUITE 900
DENVER, COLORADO 80290
303-831-8100

AFCEE BIOVENTING PILOT TESTS

Base: Mt Home ID

Site: POL YARD

ES Job No.: DE268.57.08

Sampler(s): (Signature) R. Todd Hemington

Page 1 of 1

Ship To:

PACE INCORPORATED
5702 Bolsa Ave.
Huntington Beach, CA 92649

Attn: Melony Concepcion
(714) 892-2565

Preservative: NONE | HOLD | AT 4C | NONE

Date	Time	Sample Description	Lab I.D.	No. of Contrs.	SW 9045 (PH)	A 403 (ALKA)	SW 7380 (IRON)	SW 846 (MOIST)	SW 8020 (BTEX)	E 418.1 (TRPH)	E 351.2 (TKN)	E 365.3 (PHOS)	UCM (CLASS)	Sample Type	Matrix	Remarks
7/7/94	6:50	MH-MPA-7		2	X				X	X				G C	SOIL	
7/7/94	15:25	MH-VW-18		2	X				X	X				G C	SOIL	
7/8/94	6:30	MH-MPB-14		2	X				X	X				G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	

Relinquished by: (Signature) R. Todd Hemington — Date / Time 7/8/94 — Recieved for Laboratory by: (Signature)

Relinquished by: (Signature) — Date / Time — Recieved for Laboratory by: (Signature) — Date / Time

Remarks:

G - Grab Sample, C - Composite Sample

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Federal Express Number:

Airbill Number: 1963961590

ENGINEERING-SCIENCE, INC.
1700 Broadway, Suite 900 • Denver, Colorado
(303) 831-8100

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FINAL REPORT FOR SAMPLE RECEIVED: 07/09/94

FOR

MT. HOME

PACE PROJECT NUMBER: 740709.500

- 1 copy to J. Hall
- 1 copy to Todd Harwig
- 1 copy to Battle
- 1 copy original to Dee Brown

PREPARED FOR:

ENGINEERING SCIENCE, INC.
1700 BROADWAY
SUITE 900
DENVER, COLORADO 80290

AUGUST, 1994

PREPARED BY:

PACE INCORPORATED
5702 BOLSA AVENUE
HUNTINGTON BEACH, CALIFORNIA 92649

CONTRACT NO. DE-268.19.06.08

TABLE OF CONTENTS

SECTION I

COVER LETTER

pace INCORPORATED
THE ASSURANCE OF QUALITY

REPORT OF LABORATORY ANALYSIS

August 8, 1994

Mr. Doug Downey
ENGINEERING SCIENCE - DENVER
1700 Broadway, Suite 900
Denver, Colorado 80290

Re: **PACE Project No. 740709.500**
Client Reference: Mt. Home

Dear Mr. Downey:

Enclosed is the report of laboratory analysis for three (3) soil samples received on July 9, 1994. These samples were delivered by Federal Express and received by PACE-Huntington Beach at 5°C. These samples were analyzed for total recoverable petroleum hydrocarbons, BTEX, pH, alkalinity, iron and moisture content using methods E418.1, SW8020, SW9045, A403(M), SW7380, D2216, respectively. Total Kjeldahl, phosphate and soil classification were subcontracted out to Sequoia Analytical in Redwood City, CA. All results are reported on a dry-weight basis.

A glossary of acronyms and symbols are found in Section VII.

If you have any questions regarding this report, please feel free to contact us.

Sincerely,

Melanie R. Concepcion

Melanie R. Concepcion
Project Manager
PACE-Southern California

THESE DATA HAVE BEEN REVIEWED AND ARE APPROVED FOR RELEASE.

Thizar Tintut-Williams
Quality Assurance Officer
PACE-Southern California

740709.500

5702 Bolsa Avenue
Huntington Beach, CA 92649
TEL: 714-892-2565
FAX: 714-890-4032

SECTION II

CHAIN OF CUSTODY

CHAIN OF CUSTODY RECORD

Page 1 of 1

ENGINEERING-SCIENCE, INC. 1700 BROADWAY, SUITE 900 DENVER, COLORADO 80290 303-831-8100	**AFCEE BIOVENTING PILOT TESTS**
ES Job No. DE268. 57 .08	Base: Mt. Home, ID Site: P.O.L. YARD
Sampler(s): (Signature) R. Todd Henningson	

Preservative: NONE | HOLD | AT 4C | NONE

Analysis Required: SW 9045 (PH) | A 403 (ALKA) | SW 7380 (IRON) | SW 846 (MOIST) | SW 8020 (BTEX) | E 418.1 (TRPH) | E 351.2 (TKN) | E 365.3 (PHOS) | UCM (CLASS)

Ship To:

PACE INCORPORATED
5702 Bolsa Ave.
Huntington Beach, CA 92649

Attn: Melony Concepcion
(714) 892-2565

Date	Time	Sample Description	Lab I.D.	No. of Contrs.	SW 9045 (PH)	A 403 (ALKA)	SW 7380 (IRON)	SW 846 (MOIST)	SW 8020 (BTEX)	E 418.1 (TRPH)	E 351.2 (TKN)	E 365.3 (PHOS)	UCM (CLASS)	Sample Type	Matrix	Remarks
7/7/94	16:50	MH-MPA-7		2		X			X		X			G C	SOIL	0135140
														G C	SOIL	
7/7/94	15:25	MH-VW-18		2		X			X		X			G C	SOIL	0135159
														G C	SOIL	
7/8/94	09:30	MH-MPB-14		2		X			X		X			G C	SOIL	0135167
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	
														G C	SOIL	

Relinquished by: (Signature) R. Todd Henningson	Date / Time 7/8/94 10:00 AM	Recieved for Laboratory by: (Signature) FED EX	Date / Time 7/8	Remarks: 5°C
Relinquished by: (Signature) FED EX	Date / Time 7/9/94 945	Recieved for Laboratory by: (Signature) M. R. Concepcion	Date / Time 7/9/94 945	G - Grab Sample, C - Composite Sample

Distribution: Original Accompanies Shipment. Copies to: Coordinator Field Files
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SECTION III

CROSS REFERENCE TABLE

FIELD/LABORATORY IDENTIFIER CROSS-REFERENCE TABLE

PACE PROJECT NUMBER: 740709500

DATE COLLECTED	DATE RECEIVED	PACE SAMPLE IDENTIFIER	FIELD SAMPLE IDENTIFIER
07/07/94	07/09/94	750135140	MH-MPA-7
07/07/94	07/09/94	750135159	MH-VW-18
07/07/94	07/09/94	750135167	MH-MPB-14

SECTION IV

SUMMARY OF EXTRACTION/ANALYSIS DATES

Table 4-3: Summary of Extraction and Analysis Dates

PACE Project Number: 740709500								
QC Batch Id	Field Id	Lab Id	Analysis Request	Date Collected	Date Extracted	Elapsed Days	Date Analyzed	Elapsed Days
7514314	MH-MPA-7	750135140	D2216	7-Jul-94	17-Jul-94	10	18-Jul-94	11
7514314	MH-VW-18	750135159	D2216	7-Jul-94	17-Jul-94	10	18-Jul-94	11
7514314	MH-MPB-14	750135167	D2216	7-Jul-94	17-Jul-94	10	18-Jul-94	11
7514390	MH-MPA-7	750135140	E418.1	7-Jul-94	21-Jul-94	14	21-Jul-94	14
7514390	MH-VW-18	750135159	E418.1	7-Jul-94	21-Jul-94	14	21-Jul-94	14
7514390	MH-MPB-14	750135167	E418.1	7-Jul-94	21-Jul-94	14	21-Jul-94	14
7514444	MH-MPA-7	750135140	SM403(M)	7-Jul-94	29-Jul-94	22	29-Jul-94	22
7514444	MH-VW-18	750135159	SM403(M)	7-Jul-94	29-Jul-94	22	29-Jul-94	22
7514444	MH-MPB-14	750135167	SM403(M)	7-Jul-94	29-Jul-94	22	29-Jul-94	22
7514428	MH-MPA-7	750135140	SW7380	7-Jul-94	21-Jul-94	14	22-Jul-94	15
7514428	MH-VW-18	750135159	SW7380	7-Jul-94	21-Jul-94	14	22-Jul-94	15
7514428	MH-MPB-14	750135167	SW7380	7-Jul-94	21-Jul-94	14	22-Jul-94	15
7514405	MH-MPA-7	750135140	SW8020	7-Jul-94	12-Jul-94	5	12-Jul-94	5
7514405	MH-VW-18	750135159	SW8020	7-Jul-94	12-Jul-94	5	12-Jul-94	5
7514405	MH-MPB-14	750135167	SW8020	7-Jul-94	12-Jul-94	5	12-Jul-94	5

Table 4-3: Summary of Extraction and Analysis Dates

PACE Project Number: 740709500								
QC Batch Id	Field Id	Lab Id	Analysis Request	Date Collected	Date Extracted	Elapsed Days	Date Analyzed	Elapsed Days
7514065	MH-MPA-7	750135140	SW9045	7-Jul-94	13-Jul-94	6	13-Jul-94	6
7514065	MH-VW-18	750135159	SW9045	7-Jul-94	13-Jul-94	6	13-Jul-94	6
7514065	MH-MPB-14	750135167	SW9045	7-Jul-94	13-Jul-94	6	13-Jul-94	6

000011

SECTION V

INORGANIC SECTION

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS

DATA PACKAGE

REPORT OF LABORATORY ANALYSIS

EPA Method:	E418.1	AFIID:	MOUNT
Ext/Prep Method:	SW3550	LOCID:	MH-MPA-7
		Project:	740709500
PACE Sample ID:	750135140	Contract/Donum:	NA
Batch ID:	7514390		
Client Sample ID:	MH-MPA-7		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	21-Jul-94	SACODE:	N1
Date Analyzed:	21-Jul-94		
		Percent Moisture:	15.5
Matrix:	Soil	Dilution Factor:	25

Compound	(MG/KG) Result		MDL
Total Petroleum Hydrocarbons	6310		144
End Of Results For Method			

Table 4.1(12)

REPORT OF LABORATORY ANALYSIS

EPA Method:	E418.1	AFIID:	MOUNT
Ext/Prep Method:	SW3550	LOCID:	MH-VW-18
		Project:	740709500
PACE Sample ID:	750135159	Contract/Donum:	NA
Batch ID:	7514390		
Client Sample ID:	MH-VW-18		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	21-Jul-94	SACODE:	N1
Date Analyzed:	21-Jul-94		
		Percent Moisture:	17.5
Matrix:	Soil	Dilution Factor:	25

Compound	(MG/KG) Result		MDL
Total Petroleum Hydrocarbons	5940		147
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	E418.1	AFIID:	MOUNT
Ext/Prep Method:	SW3550	LOCID:	MH-MPB-14
		Project:	740709500
PACE Sample ID:	750135167	Contract/Donum:	NA
Batch ID:	7514390		
Client Sample ID:	MH-MPB-14		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	21-Jul-94	SACODE:	N1
Date Analyzed:	21-Jul-94		
		Percent Moisture:	18.0
Matrix:	Soil	Dilution Factor:	25

Compound	(MG/KG) Result		MDL
Total Petroleum Hydrocarbons	5290		150
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	E418.1	AFIID:	MOUNT
Ext/Prep Method:	SW3550	LOCID:	LABQC
		Project:	QC
PACE Sample ID:	758324201	Contract/Donum:	NA
Batch ID:	7514390		
Client Sample ID:	Method Blank		
Date Collected:	NA	SBD:	0
Date Received:	NA	SED:	0
Date Ext/Prep:	21-Jul-94	SACODE:	LB1
Date Analyzed:	21-Jul-94		
		Percent Moisture:	0
Matrix:	Soil/Solid Quality Control Matrix	Dilution Factor:	1

Compound	(MG/KG) Result		MDL
Total Petroleum Hydrocarbons	ND		5.0
End Of Results For Method			

LAB Q.C. BATCH/FIELD I.D.

CROSS-REFERENCE TABLE

PACE Project Number: 740709500

QC BATCH IDENTIFIER	DATE ANALYZED	ANALYTICAL METHOD	PACE SAMPLE IDENTIFIER	FIELD SAMPLE IDENTIFIER
7514390	21-JUL-94	E418.1	750135140	MH-MPA-7
7514390	21-JUL-94	E418.1	750135167	MH-MPB-14
7514390	21-JUL-94	E418.1	750135159	MH-VW-18

QUALITY CONTROL REPORT

Analytical Method: E418.1
Analytical Batch ID: 7514390
Date of Analysis: 07/21/94
Instrument ID: IR #1
Calibration Reference #: 2/18/94

Solid X
Water _

Field Sample ID: MH-MPA-7 | MH-VW-18 | MH-MPB-14

Quality Control Samples	Target Concentrations (MG/KG)	Recovery (%)			RPD (%)		Corrective Action
		Spike	Spike Duplicate	Control Limits	Results	Control Limits	
Laboratory Control Sample List Of Analytes							
Total Petroleum Hydrocarbons	199	97	95	75-125	2	40	

000019

PACE Project: 740709500

Table 4.4.2

IRON DATA PACKAGE

REPORT OF LABORATORY ANALYSIS

EPA Method:	SW7380	AFIID:	MOUNT
Ext/Prep Method:	SW3050	LOCID:	MH-MPA-7
		Project:	740709500
PACE Sample ID:	750135140	Contract/Donum:	NA
Batch ID:	7514428		
Client Sample ID:	MH-MPA-7		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	21-Jul-94	SACODE:	N1
Date Analyzed:	22-Jul-94		
		Percent Moisture:	15.5
Matrix:	Soil	Dilution Factor:	50

Compound	(MG/KG) Result		MDL
Iron	16600		1150
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SW7380	AFIID:	MOUNT
Ext/Prep Method:	SW3050	LOCID:	MH-VW-18
		Project:	740709500
PACE Sample ID:	750135159	Contract/Donum:	NA
Batch ID:	7514428		
Client Sample ID:	MH-VW-18		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	21-Jul-94	SACODE:	N1
Date Analyzed:	22-Jul-94		
		Percent Moisture:	17.5
Matrix:	Soil	Dilution Factor:	50

Compound	(MG/KG) Result		MDL
Iron	27900		1170
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SW7380	AFIID:	MOUNT
Ext/Prep Method:	SW3050	LOCID:	MH-MPB-14
		Project:	740709500
PACE Sample ID:	750135167	Contract/Donum:	NA
Batch ID:	7514428		
Client Sample ID:	MH-MPB-14		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	21-Jul-94	SACODE:	N1
Date Analyzed:	22-Jul-94		
		Percent Moisture:	18.0
Matrix:	Soil	Dilution Factor:	50

Compound	(MG/KG) Result		MDL
Iron	22700		1180
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method: SW7380
Ext/Prep Method: METHOD

PACE Sample ID: 758325291
Batch ID: 7514428
Client Sample ID: Method Blank

Date Collected: NA
Date Received: NA
Date Ext/Prep: 21-Jul-94
Date Analyzed: 22-Jul-94

Matrix: Soil/Solid Quality Control Matrix

AFIID: MOUNT
LOCID: LABQC
Project: QC
Contract/Donum: NA

SBD: 0
SED: 0
SACODE: LB1

Percent Moisture: 0
Dilution Factor: 1

Compound	(MG/KG) Result		MDL
Iron	ND		20
End Of Results For Method			

LAB Q.C. BATCH/FIELD I.D.

CROSS-REFERENCE TABLE

PACE Project Number: 740709500

QC BATCH IDENTIFIER	DATE ANALYZED	ANALYTICAL METHOD	PACE SAMPLE IDENTIFIER	FIELD SAMPLE IDENTIFIER
7514428	22-JUL-94	SW7380	750135140	MH-MPA-7
7514428	22-JUL-94	SW7380	750135167	MH-MPB-14
7514428	22-JUL-94	SW7380	750135159	MH-VW-18

QUALITY CONTROL REPORT

Analytical Method: SW7380
Analytical Batch ID: 7514428
Date of Analysis: 07/22/94
Instrument ID: FAA #1
Calibration Reference #: 7/22/94

Solid X
Water _

Field Sample ID: MH-MPA-7 | MH-VW-18 | MH-MPB-14

Quality Control Samples	Target Concentrations (MG/KG)	Recovery (%)			RPD (%)		Corrective Action
		Spike	Spike Duplicate	Control Limits	Results	Control Limits	
Laboratory Control Sample List Of Analytes							
Iron	250	101	99	80-120	2	40	

0000026

PACE Project: 740709500

Table 4.4.6

WET CHEMISTRY DATA PACKAGE

REPORT OF LABORATORY ANALYSIS

EPA Method:	SM403(M)	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	MH-MPA-7
		Project:	740709500
PACE Sample ID:	750135140	Contract/Donum:	NA
Batch ID:	7514444		
Client Sample ID:	MH-MPA-7		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	29-Jul-94	SACODE:	N1
Date Analyzed:	29-Jul-94		
		Percent Moisture:	15.5
Matrix:	Soil	Dilution Factor:	1

Compound	(MG/KG) Result		MDL
Alkalinity, Total (As CaCO3)	1040		47
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SM403(M)	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	MH-VW-18
		Project:	740709500
PACE Sample ID:	750135159	Contract/Donum:	NA
Batch ID:	7514444		
Client Sample ID:	MH-VW-18		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	29-Jul-94	SACODE:	N1
Date Analyzed:	29-Jul-94		
		Percent Moisture:	17.5
Matrix:	Soil	Dilution Factor:	1

Compound	(MG/KG) Result		MDL
Alkalinity, Total (As CaCO3)	1060		48
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SM403(M)	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	MH-MPB-14
		Project:	740709500
PACE Sample ID:	750135167	Contract/Donum:	NA
Batch ID:	7514444		
Client Sample ID:	MH-MPB-14		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	29-Jul-94	SACODE:	N1
Date Analyzed:	29-Jul-94		
		Percent Moisture:	18.0
Matrix:	Soil	Dilution Factor:	1

Compound	(MG/KG) Result		MDL
Alkalinity, Total (As CaCO3)	220		48
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SM403(M)	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	LABQC
		Project:	QC
PACE Sample ID:	758325712	Contract/Donum:	NA
Batch ID:	7514444		
Client Sample ID:	Method Blank		
Date Collected:	NA	SBD:	0
Date Received:	NA	SED:	0
Date Ext/Prep:	29-Jul-94	SACODE:	LB1
Date Analyzed:	29-Jul-94		
		Percent Moisture:	0
Matrix:	Soil/Solid Quality Control Matrix	Dilution Factor:	1

Compound	(MG/KG) Result		MDL
Alkalinity, Total (As CaCO3)	ND		40
End Of Results For Method			

LAB Q.C. BATCH/FIELD I.D.

CROSS-REFERENCE TABLE

PACE Project Number: 740709500

QC BATCH IDENTIFIER	DATE ANALYZED	ANALYTICAL METHOD	PACE SAMPLE IDENTIFIER	FIELD SAMPLE IDENTIFIER
7514444	29-JUL-94	SM403(M)	750135140	MH-MPA-7
7514444	29-JUL-94	SM403(M)	750135167	MH-MPB-14
7514444	29-JUL-94	SM403(M)	750135159	MH-VW-18

QUALITY CONTROL REPORT

Analytical Method: SM403(M)
Analytical Batch ID: 7514444
Date of Analysis: 07/29/94
Instrument ID: NA
Calibration Reference #: 7/29/94

Solid X
Water _

Field Sample ID: MH-MPA-7, MH-VW-18, MH-MPB-14

Quality Control Samples	Target Concentrations (MG/KG)	Recovery (%)			RPD (%)		Corrective Action
		Spike	Spike Duplicate	Control Limits	Results	Control Limits	
Laboratory Control Sample List Of Analytes							
Alkalinity, Total (As CaCO3)	1870	95	94	75-125	1	40	

0000033

PACE Project: 740709500

Table 4.4.8

REPORT OF LABORATORY ANALYSIS

EPA Method:	SW9045	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	MH-MPA-7
		Project:	740709500
PACE Sample ID:	750135140	Contract/Donum:	NA
Batch ID:	7514065		
Client Sample ID:	MH-MPA-7		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	13-Jul-94	SACODE:	N1
Date Analyzed:	13-Jul-94		
		Percent Moisture:	15.5
Matrix:	Soil	Dilution Factor:	1

Compound	(PH UNITS) Result		MDL
pH	7.8		NA
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SW9045	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	MH-VW-18
		Project:	740709500
PACE Sample ID:	750135159	Contract/Donum:	NA
Batch ID:	7514065		
Client Sample ID:	MH-VW-18		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	13-Jul-94	SACODE:	N1
Date Analyzed:	13-Jul-94		
		Percent Moisture:	17.5
Matrix:	Soil	Dilution Factor:	1

Compound	(PH UNITS) Result		MDL
pH	8.6		NA
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SW9045	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	MH-MPB-14
		Project:	740709500
PACE Sample ID:	750135167	Contract/Donum:	NA
Batch ID:	7514065		
Client Sample ID:	MH-MPB-14		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	13-Jul-94	SACODE:	N1
Date Analyzed:	13-Jul-94		
		Percent Moisture:	18.0
Matrix:	Soil	Dilution Factor:	1

Compound	(PH UNITS) Result		MDL
pH	8.2		NA
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	D2216	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	MH-MPA-7
		Project:	740709500
PACE Sample ID:	750135140	Contract/Donum:	NA
Batch ID:	7514314		
Client Sample ID:	MH-MPA-7		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	17-Jul-94	SACODE:	N1
Date Analyzed:	18-Jul-94		
		Percent Moisture:	15.5
Matrix:	Soil	Dilution Factor:	1

Compound	(PERCENT) Result		MDL
Moisture, Percent	15.5		NA
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	D2216	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	MH-VW-18
		Project:	740709500
PACE Sample ID:	750135159	Contract/Donum:	NA
Batch ID:	7514314		
Client Sample ID:	MH-VW-18		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	17-Jul-94	SACODE:	N1
Date Analyzed:	18-Jul-94		
		Percent Moisture:	17.5
Matrix:	Soil	Dilution Factor:	1

Compound	(PERCENT) Result		MDL
Moisture, Percent	17.5		NA
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	D2216	AFIID:	MOUNT
Ext/Prep Method:	METHOD	LOCID:	MH-MPB-14
		Project:	740709500
PACE Sample ID:	750135167	Contract/Donum:	NA
Batch ID:	7514314		
Client Sample ID:	MH-MPB-14		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	17-Jul-94	SACODE:	N1
Date Analyzed:	18-Jul-94		
		Percent Moisture:	18.0
Matrix:	Soil	Dilution Factor:	1

Compound	(PERCENT) Result		MDL
Moisture, Percent	18.0		NA
End Of Results For Method			

SECTION VI

ORGANICS SECTION

SW8020 (BTEX) DATA PACKAGE

REPORT OF LABORATORY ANALYSIS

EPA Method: SW8020
Ext/Prep Method: SW5030

PACE Sample ID: 750135140
Batch ID: 7514405
Client Sample ID: MH-MPA-7

Date Collected: 07-Jul-94
Date Received: 09-Jul-94
Date Ext/Prep: 12-Jul-94
Date Analyzed: 12-Jul-94

Matrix: Soil

AFIID: MOUNT
LOCID: MH-MPA-7
Project: 740709500
Contract/Donum: NA

SBD: 0
SED: 0
SACODE: N1

Percent Moisture: 15.5
Dilution Factor: 5000

Compound	(MG/KG) Result		MDL
Benzene	60		3.0
Toluene	350		3.0
Ethylbenzene	72		3.0
Xylenes, Total	840		4.1
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SW8020	AFIID:	MOUNT
Ext/Prep Method:	SW5030	LOCID:	MH-VW-18
		Project:	740709500
PACE Sample ID:	750135159	Contract/Donum:	NA
Batch ID:	7514405		
Client Sample ID:	MH-VW-18		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	12-Jul-94	SACODE:	N1
Date Analyzed:	12-Jul-94		
		Percent Moisture:	17.5
Matrix:	Soil	Dilution Factor:	5000

Compound	(MG/KG) Result		MDL
Benzene	130		3.0
Toluene	660		3.0
Ethylbenzene	110		3.0
Xylenes, Total	1210		4.2
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SW8020	AFIID:	MOUNT
Ext/Prep Method:	SW5030	LOCID:	MH-MPB-14
		Project:	740709500
PACE Sample ID:	750135167	Contract/Donum:	NA
Batch ID:	7514405		
Client Sample ID:	MH-MPB-14		
Date Collected:	07-Jul-94	SBD:	0
Date Received:	09-Jul-94	SED:	0
Date Ext/Prep:	12-Jul-94	SACODE:	N1
Date Analyzed:	12-Jul-94		
		Percent Moisture:	18.0
Matrix:	Soil	Dilution Factor:	5000

Compound	(MG/KG) Result		MDL
Benzene	61		3.1
Toluene	300		3.1
Ethylbenzene	64		3.1
Xylenes, Total	740		4.3
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS

EPA Method:	SW8020	AFIID:	MOUNT
Ext/Prep Method:	SW5030	LOCID:	LABQC
		Project:	QC
PACE Sample ID:	758324732	Contract/Donum:	NA
Batch ID:	7514405		
Client Sample ID:	Method Blank		
Date Collected:	NA	SBD:	0
Date Received:	NA	SED:	0
Date Ext/Prep:	12-Jul-94	SACODE:	LB1
Date Analyzed:	12-Jul-94		
		Percent Moisture:	0
Matrix:	Soil/Solid Quality Control Matrix	Dilution Factor:	1

Compound	(MG/KG) Result		MDL
Benzene	ND		0.0005
Toluene	ND		0.0005
Ethylbenzene	ND		0.0005
Xylenes, Total	ND		0.0007
End Of Results For Method			

REPORT OF LABORATORY ANALYSIS
SURROGATE RECOVERY REPORT

EPA Method: SW8020
Matrix: Soil

AFIID: MOUNT
PACE Project: 740709.500

PACE Q.C. SAMPLE I.D. CLIENT SAMPLE ID	S1 (%)	TOTAL OUT
Batch No. 7514405		
MH-MPA-7	114	0
MH-VW-18	94	0
MH-MPB-14	108	0
Method Blank	88	0
LCS	76	0
LCSD	86	0

QC LIMITS	
	SOIL (%)
S1 = a,a,a-Trifluorotoluene	60-140

* = Values outside of Q.C. Limits
D = Surrogate diluted out

LAB Q.C. BATCH/FIELD I.D.

CROSS-REFERENCE TABLE

PACE Project Number: 740709500

QC BATCH IDENTIFIER	DATE ANALYZED	ANALYTICAL METHOD	PACE SAMPLE IDENTIFIER	FIELD SAMPLE IDENTIFIER
7514405	12-JUL-94	SW8020	750135140	MH-MPA-7
7514405	12-JUL-94	SW8020	750135167	MH-MPB-14
7514405	12-JUL-94	SW8020	750135159	MH-VW-18

QUALITY CONTROL REPORT

Analytical Method: SW8020
Analytical Batch ID: 7514405
Date of Analysis: 07/12/94
Instrument ID: GC #1
Calibration Reference #: 6/1/94

Solid X
Water _

Field Sample ID: MH-MPA-7, MH-VW-18, MH-MPB-14

Quality Control Samples	Target Concentrations (MG/KG)	Recovery (%)			RPD (%)		Corrective Action
		Spike	Spike Duplicate	Control Limits	Results	Control Limits	
Laboratory Control Sample List Of Analytes							
Benzene	0.02	90	82	73-125	9	18	
Toluene	0.02	94	86	77-123	9	17	
Ethylbenzene	0.02	95	87	72-125	9	15	
Xylenes, Total	0.06	96	88	76-123	9	16	

0110048

PACE Project: 740709500

Table 4.4.4

SECTION VII

GLOSSARY OF ACRONYMS AND SYMBOLS

GLOSSARY OF ACRONYMS AND SYMBOLS

ACRONYM/SYMBOL	DEFINITION
MDL	Method Detection Limit
NA	Not applicable.
NC	Not calculated.
ND	Not Detected
RPD	Relative Percent Difference.
D	Detectable.
J	Detected but below the PQL; therefore, result is an estimated concentration.
X	Please see NCR Ref. No.:___.

SECTION VIII

SUBCONTRACTED ANALYSES

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
1900 Bates Avenue, Suite L, Concord, CA 94520, (510) 686-9600, FAX (510) 686-9689
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

000052

Pace
5702 Bolsa Ave.
Huntington Beach, CA 92649
Attention: Melanie Concepcion

Client Project ID: Mountain Home
Sample Descript: Soil
Analysis for: Phosphate
First Sample #: 4G48601

Sampled: Jul 7, 1994
Received: Jul 12, 1994
Analyzed: Jul 13, 1994
Reported: Aug 5, 1994

LABORATORY ANALYSIS FOR: Phosphate

Sample Number	Sample Description	Detection Limit mg/kg	Sample Result mg/kg
4G48601	MH-MPB-14	10	N.D.
4G48602	MH-VW-18	10	N.D.
4G8603	MH-MPA-7	10	N.D.

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Mark J. Cargasacchi
Project Manager

Please Note:
Results in dry weight.

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
1900 Bates Avenue, Suite L, Concord, CA 94520, (510) 686-9600, FAX (510) 686-9689
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

000053

Pace	Client Project ID:	Mountain Home	Sampled:	Jul 7, 1994
5702 Bolsa Ave.	Sample Descript:	Soil	Received:	Jul 12, 1994
Huntington Beach, CA 92649	Analysis for:	Total Kjeldahl Nitrogen		
Attention: Melanie Concepcion	First Sample #:	4G48601	Analyzed:	Jul 21, 1994
			Reported:	Aug 5, 1994

LABORATORY ANALYSIS FOR: Total Kjeldahl Nitrogen

Sample Number	Sample Description	Detection Limit mg/kg	Sample Result mg/kg
4G48601	MH-MPB-14	40	82
4G48602	MH-VW-18	40	70
4G8603	MH-MPA-7	40	64

Analytes reported as N.D. were not present above the stated limit of detection.

SEQUOIA ANALYTICAL

Mark J. Cargasacchi
Project Manager

Please Note:
Results in dry weight.

4G48601.PPP <2>

Sequoia Analytical

680 Chesapeake Drive, Redwood City, CA 94063, (415) 364-9600, FAX (415) 364-9233
1900 Bates Avenue, Suite L, Concord, CA 94520, (510) 686-9600, FAX (510) 686-9689
819 Striker Avenue, Suite 8, Sacramento, CA 95834, (916) 921-9600, FAX (916) 921-0100

000054

Pace
5702 Bolsa Ave.
Huntington Beach, CA 92649
Attention: Melanie Concepcion

Client Project ID: Mountain Home
Matrix: Solid
QC Sample Group: 4G48601-03
Reported: Aug 5, 1994

QUALITY CONTROL DATA REPORT

ANALYTE	Phosphate	Total Kjeldahl Nitrogen
Method:	EPA 300.0	EPA 351.4
Analyst:	S. Flynn	L. Stenstrom
MS/MSD Batch#:	4G48201	4G43412
Date Prepared:	7/13/94	7/20/94
Date Analyzed:	7/13/94	7/20/94
Instrument I.D.#:	IC	N/A
Conc. Spiked:	100 mg/L	1000 mg/L
Matrix Spike % Recovery:	100	92
Matrix Spike Duplicate % Recovery:	100	96
Relative % Difference:	0.0	4.2
LCS Batch#:		
Date Prepared:		
Date Analyzed:		
Instrument I.D.#:		
LCS % Recovery:		
% Recovery Control Limits:	80-120	60-140

SEQUOIA ANALYTICAL

Mark J. Cargasacchi
Project Manager

Please Note:
The LCS is a control sample of known, interferent free matrix that is analyzed using the same reagents, preparation, and analytical methods employed for the samples. The matrix spike is an aliquot of sample fortified with known quantities of specific compounds and subjected to the entire analytical procedure. If the recovery of analytes from the matrix spike does not fall within specified control limits due to matrix interference, the LCS recovery is to be used to validate the batch.

SEQUOIA ANALYTICAL LABORATORY

Particle Size Distribution by Sieve and Hydrometer

Method: **ASTM D422-63**
Analyzed: 7/15/94
Lab ID: 9407486-1A
Client ID: MH-MPB-14
Sample Description: SOIL

SIEVE TEST

A. Total weight of sample:	278.89	g
B. Weight retained in No.10 sieve:	6.02	g
C. % passing No.10 sieve:	97.84	%

Sieve test for weight retained in a No.10 sieve.

SIEVE SIZE	WEIGHT RETAINED(g)	% RETAINED	CUMULATIVE % RETAINED	CUMULATIVE % PASSING
1 1/2 in	0.00	0.00	0.00	100.00
3/8 in	0.00	0.00	0.00	100.00
No. 4	1.71	0.61	0.61	99.39
No. 10	4.31	1.55	2.16	97.84
No. 200	111.00	39.80	41.96	58.04

HYDROMETER TEST

ELAPSED TIME (min)	TEMP. (deg C)	HYDROMETER READING (H)	CORRECTED READING (R)	(L)	PARTICLE DIAM. in mm (S)	% SUSPENDED (P)
2	21	30	26	12	0.0330	41.2
5	21	25	21	12.9	0.0217	33.3
10	21	22	18	13.3	0.0155	28.5
15	21	20	16	13.7	0.0129	25.4
25	21	18	14	14	0.0101	22.2
40	21	16	12	14.3	0.0081	19.0
60	21	14	10	14.7	0.0067	15.8
90	21	13	9	14.8	0.0055	14.3
120	21	12	8	15	0.0048	12.7
1440	21	8	4	15.6	0.0014	6.3

Weight of soil used in hydrometer test (D):	65	g
Hygroscopic moisture correction factor (G):	0.95	
Specific gravity (Assumed):	2.65	
Dispersing agent correction factor (E):	3	
Meniscus correction factor (F):	1	
Temp./Spec. gravity dependant constant (K):	0.01348	

Formulas:

$R = H - E - F$

$S = K[SQRT(L/T)]$

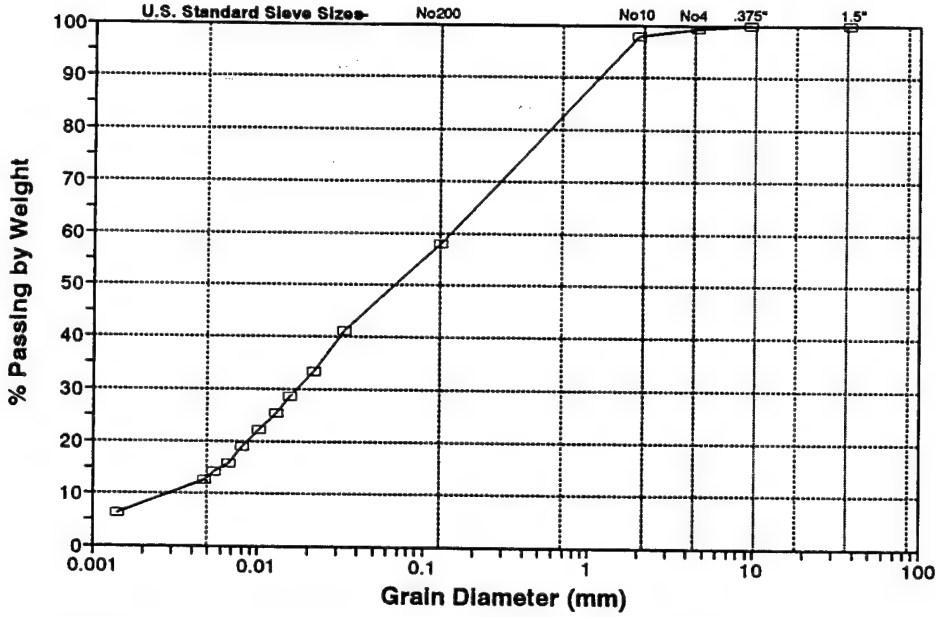
$P = (R/W)100$

$W = (J \times 100)/C$

$J = D \times G$

Method: **ASTM D422-63**
Analyzed: 7/15/94
Lab ID: 9407486-1A

Graph of Acquired Data



Clay Sizes	Silt Sizes	Fine	Medium	Coars	Fine	Coarse	
Fines		Sand			Gravel		Cobbles

Graphing Data:

Part. Diam. (mm)	Percent Suspended
37.5	100.00
9.5	100.00
4.5	99.39
2	97.84
0.127	58.04
0.0330	41.20
0.0217	33.27
0.0155	28.52
0.0129	25.35
0.0101	22.18
0.0081	19.01
0.0067	15.84
0.0055	14.26
0.0048	12.68
0.0014	6.34

Sample Composition:

(1) Gravel, passing 3-in. and retained on No. 4 sieve	0.6 %
(2) Sand, passing No. 4 sieve and retained on No. 200 sieve	41.3 %
(3) Silt size, 0.074 to 0.005 mm	45.4 %
(4) Clay size, smaller than 0.005 mm	12.7 %

SEQUOIA ANALYTICAL LABORATORY

Particle Size Distribution by Sieve and Hydrometer

Method: **ASTM D422-63**
Analyzed: 7/15/94
Lab ID: 94.7486-2A
Client ID: MH-VW-18
Sample Description: SOIL

SIEVE TEST

A. Total weight of sample:	280.11	g
B. Weight retained in No.10 sieve:	72.3	g
C. % passing No.10 sieve:	74.19	%

Sieve test for weight retained in a No.10 sieve.

SIEVE SIZE	WEIGHT RETAINED(g)	% RETAINED	CUMULATIVE % RETAINED	CUMULATIVE % PASSING
1 1/2 in	0.00	0.00	0.00	100.00
3/8 in	1.92	0.69	0.69	99.31
No. 4	9.74	3.48	4.16	95.84
No. 10	60.64	21.65	25.81	74.19
No. 200	83.41	29.78	55.59	44.41

HYDROMETER TEST

ELAPSED TIME (min)	TEMP. (deg C)	HYDROMETER READING (H)	CORRECTED READING (R)	(L)	PARTICLE DIAM. in mm (S)	% SUSPENDED (P)
2	21	26	22	12.7	0.0340	26.4
5	21	21	17	13.5	0.0221	20.4
10	21	19	15	13.8	0.0158	18.0
15	21	17	13	14.2	0.0131	15.6
25	21	15	11	14.5	0.0103	13.2
40	21	14	10	14.7	0.0082	12.0
60	21	13	9	14.8	0.0067	10.8
90	21	12	8	15	0.0055	9.6
120	21	11	7	15.2	0.0048	8.4
1440	21	8	4	15.6	0.0014	4.8

Weight of soil used in hydrometer test (D):	65	g
Hygroscopic moisture correction factor (G):	0.95	
Specific gravity (Assumed):	2.65	
Dispersing agent correction factor (E):	3	
Meniscus correction factor (F):	1	
Temp./Spec. gravity dependant constant (K):	0.01348	

Formulas:

$R = H - E - F$

$S = K[SQRT(L/T)]$

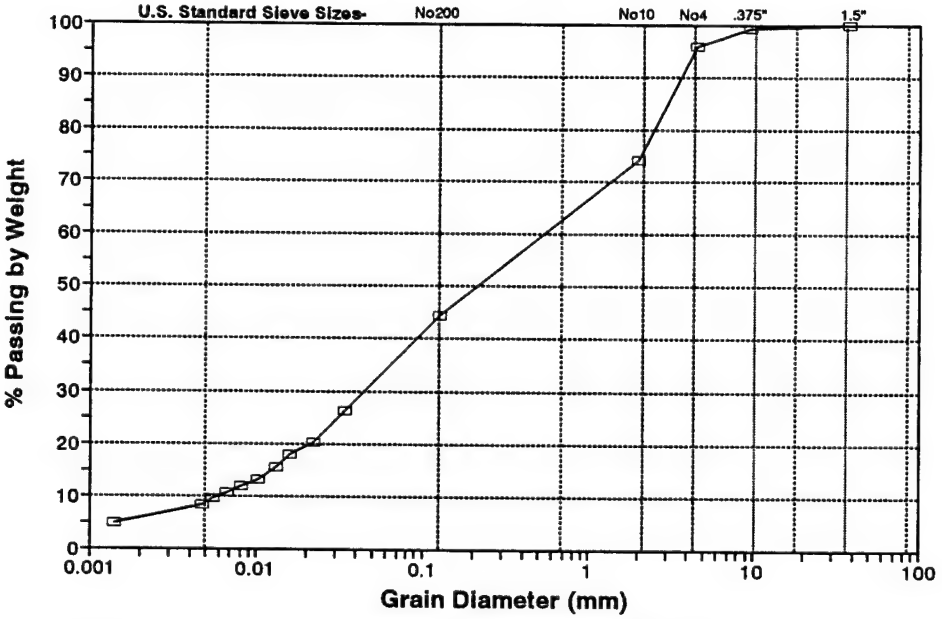
$P = (R/W)100$

$W = (J \times 100)/C$

$J = D \times G$

Method: **ASTM D422-63**
Analyzed: 7/15/94
Lab ID: 94.7486-2A

Graph of Acquired Data



Clay Sizes	Silt Sizes	Fine	Medium	Coars	Fine	Coarse	Cobbles
Fines		Sand			Gravel		

Graphing Data:

Part. Diam. (mm)	Percent Suspended
37.5	100.00
9.5	99.31
4.5	95.84
2	74.19
0.127	44.41
0.0340	26.43
0.0221	20.42
0.0158	18.02
0.0131	15.62
0.0103	13.22
0.0082	12.01
0.0067	10.81
0.0055	9.61
0.0048	8.41
0.0014	4.81

Sample Composition:

(1) Gravel, passing 3-in. and retained on No. 4 sieve	4.2 %
(2) Sand, passing No. 4 sieve and retained on No. 200 sieve	51.4 %
(3) Silt size, 0.074 to 0.005 mm	36.0 %
(4) Clay size, smaller than 0.005 mm	8.4 %

SEQUOIA ANALYTICAL LABORATORY

Particle Size Distribution by Sieve and Hydrometer

Method: **ASTM D422-63**
Analyzed: 7/15/94
Lab ID: 9407486-3A
Client ID: MH-MPA-7
Sample Description: SOIL

SIEVE TEST

A. Total weight of sample:	322.94	g
B. Weight retained in No.10 sieve:	23.91	g
C. % passing No.10 sieve:	92.60	%

Sieve test for weight retained in a No.10 sieve.

SIEVE SIZE	WEIGHT RETAINED(g)	% RETAINED	CUMULATIVE % RETAINED	CUMULATIVE % PASSING
1 1/2 in	0.00	0.00	0.00	100.00
3/8 in	0.00	0.00	0.00	100.00
No. 4	8.79	2.72	2.72	97.28
No. 10	15.12	4.68	7.40	92.60
No. 200	167.82	51.97	59.37	40.63

HYDROMETER TEST

ELAPSED TIME (min)	TEMP. (deg C)	HYDROMETER READING (H)	CORRECTED READING (R)	(L)	PARTICLE DIAM. in mm (S)	% SUSPENDED (P)
2	21	21	17	13.5	0.0350	25.0
5	21	17	13	14.2	0.0227	19.1
10	21	16	12	14.3	0.0161	17.6
15	21	14	10	14.7	0.0133	14.7
25	21	13	9	14.8	0.0104	13.2
40	21	12	8	15	0.0083	11.7
60	21	11	7	15.2	0.0068	10.3
90	21	10	6	15.3	0.0056	8.8
120	21	10	6	15.3	0.0048	8.8
1440	21	8	4	15.6	0.0014	5.9

Weight of soil used in hydrometer test (D):	65	g
Hygroscopic moisture correction factor (G):	0.97	
Specific gravity (Assumed):	2.65	
Dispersing agent correction factor (E):	3	
Meniscus correction factor (F):	1	
Temp./Spec. gravity dependant constant (K):	0.01348	

Formulas:

$R = H - E - F$

$S = K[SQRT(L/T)]$

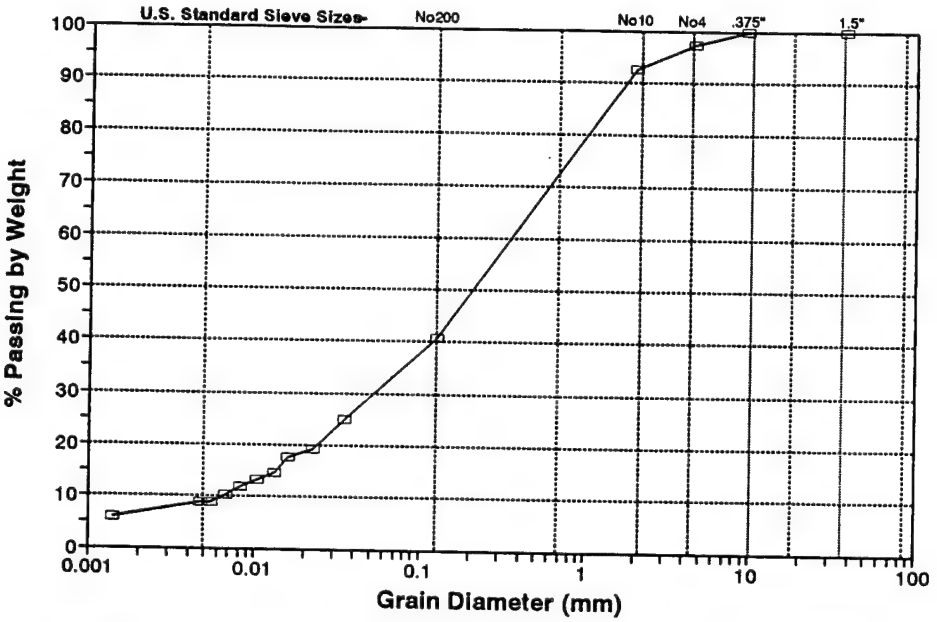
$P = (R/W)100$

$W = (J \times 100)/C$

$J = D \times G$

Method: **ASTM D422-63**
Analyzed: 7/15/94
Lab ID: 9407486-3A

Graph of Acquired Data



Clay Sizes	Silt Sizes	Fine	Medium	Coars	Fine	Coarse	Cobbles
Fines		Sand			Gravel		

Graphing Data:

Part. Diam. (mm)	Percent Suspended
37.5	100.00
9.5	100.00
4.5	97.28
2	92.60
0.127	40.63
0.0350	24.97
0.0227	19.09
0.0161	17.62
0.0133	14.69
0.0104	13.22
0.0083	11.75
0.0068	10.28
0.0056	8.81
0.0048	8.81
0.0014	5.87

Sample Composition:

(1) Gravel, passing 3-in. and retained on No. 4 sieve	2.7 %
(2) Sand, passing No. 4 sieve and retained on No. 200 sieve	56.6 %
(3) Silt size, 0.074 to 0.005 mm	31.8 %
(4) Clay size, smaller than 0.005 mm	8.8 %

File 722408.57F

9407068 Engineering Science

@ AIR TOXICS LTD.

AN ENVIRONMENTAL ANALYTICAL LABORATORY

WORK ORDER #: 9407068

Work Order Summary

CLIENT: Ms. Diana Schenfeld
Engineering Science
1700 Broadway, Suite 900
Denver, CO 80290

BILL TO: Same

PHONE: 303-831-8100
FAX: 303-831-8208
DATE RECEIVED: 7/12/94
DATE COMPLETED: 7/21/94

INVOICE # 4095
P.O. # 722408.57
PROJECT # 722408.57040 Mt. Home AFB
AMOUNT$: $390.00

FRACTION #	NAME	TEST	RECEIPT VAC./PRES.	PRICE
01A	MH-VW	TO-3	4.5 "Hg	$120.00
02A	MH-MPA-6	TO-3	4.5 "Hg	$120.00
03A	MH-MPC-13	TO-3	4.5 "Hg	$120.00
04A	Lab Blank	TO-3	NA	NC
04B	Lab Blank	TO-3	NA	NC

Misc. Charges	1 Liter SUMMA Canister Preparation (3) @ $10.00 each.	$30.00

CERTIFIED BY: Robert Crosman
Laboratory Director

DATE: 7/21/94

180 BLUE RAVINE ROAD, SUITE B • FOLSOM, CA 95630
(916) 985-1000 • FAX (916) 985-1020

AIR TOXICS LTD.

SAMPLE NAME: MH-VW
ID#: 9407068-01A

EPA METHOD TO-3
(Aromatic Volatile Organics in Air)

GC/PID

File Name:	6071816	Date of Collection: 7/9/94
Dil. Factor:	12000	Date of Analysis: 7/18/94

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	12	39	1100	3600
Toluene	12	46	1000	3800
Ethyl Benzene	12	53	36	160
Total Xylenes	12	53	360	1600

TOTAL PETROLEUM HYDROCARBONS
GC/FID
(Quantitated as Jet Fuel)

File Name:	6071816	Date of Collection: 7/9/94
Dil. Factor:	12000	Date of Analysis: 7/18/94

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
TPH*	120	780	130000	840000

*TPH referenced to Jet Fuel (MW=156)

Container Type: 1 Liter SUMMA Canister

AIR TOXICS LTD.

SAMPLE NAME: MH-MPA-6
ID#: 9407068-02A

EPA METHOD TO-3
(Aromatic Volatile Organics in Air)

GC/PID

File Name:	**6071320**	**Date of Collection:**	**7/9/94**
Dil. Factor:	**30000**	**Date of Analysis:**	**7/13/94**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	30	97	540	1800
Toluene	30	110	680	2600
Ethyl Benzene	30	130	39	170
Total Xylenes	30	130	440	1900

TOTAL PETROLEUM HYDROCARBONS
GC/FID
(Quantitated as Jet Fuel)

File Name:	**6071320**	**Date of Collection:**	**7/9/94**
Dil. Factor:	**30000**	**Date of Analysis:**	**7/13/94**

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
TPH*	300	1900	60000	390000

*TPH referenced to Jet Fuel (MW=156)

Container Type: 1 Liter SUMMA Canister

AIR TOXICS LTD.

SAMPLE NAME: MH-MPC-13
ID#: 9407068-03A

EPA METHOD TO-3
(Aromatic Volatile Organics in Air)

GC/PID

File Name:	6071319	Date of Collection: 7/9/94
Dil. Factor:	600	Date of Analysis: 7/13/94

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.60	1.9	22	71
Toluene	0.60	2.3	3.6	14
Ethyl Benzene	0.60	2.6	0.60	2.6
Total Xylenes	0.60	2.6	3.6	16

TOTAL PETROLEUM HYDROCARBONS
GC/FID
(Quantitated as Jet Fuel)

File Name:	6071319	Date of Collection: 7/9/94
Dil. Factor:	600	Date of Analysis: 7/13/94

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
TPH*	6.0	39	10000	65000

*TPH referenced to Jet Fuel (MW=156)

Container Type: 1 Liter SUMMA Canister

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank
ID#: 9407068-04A

EPA METHOD TO-3
(Aromatic Volatile Organics in Air)

GC/PID

File Name:	6071305	Date of Collection: NA
Dil. Factor:	1.0	Date of Analysis: 7/13/94

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.001	0.003	Not Detected	Not Detected
Toluene	0.001	0.004	Not Detected	Not Detected
Ethyl Benzene	0.001	0.004	Not Detected	Not Detected
Total Xylenes	0.001	0.004	Not Detected	Not Detected

TOTAL PETROLEUM HYDROCARBONS
GC/FID
(Quantitated as Jet Fuel)

File Name:	6071305	Date of Collection: NA
Dil. Factor:	1.0	Date of Analysis: 7/13/94

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
TPH*	0.010	0.065	Not Detected	Not Detected

*TPH referenced to Jet Fuel (MW=156)

Container Type: NA

AIR TOXICS LTD.

SAMPLE NAME: Lab Blank
ID#: 9407068-04B

EPA METHOD TO-3
(Aromatic Volatile Organics in Air)

GC/PID

File Name:	6071804	Date of Collection: NA
Dil. Factor:	1.0	Date of Analysis: 7/18/94

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
Benzene	0.001	0.003	Not Detected	Not Detected
Toluene	0.001	0.004	Not Detected	Not Detected
Ethyl Benzene	0.001	0.004	Not Detected	Not Detected
Total Xylenes	0.001	0.004	Not Detected	Not Detected

TOTAL PETROLEUM HYDROCARBONS
GC/FID
(Quantitated as Jet Fuel)

File Name:	6071804	Date of Collection: NA
Dil. Factor:	1.0	Date of Analysis: 7/18/94

Compound	Det. Limit (ppmv)	Det. Limit (uG/L)	Amount (ppmv)	Amount (uG/L)
TPH*	0.010	0.065	Not Detected	Not Detected

*TPH referenced to Jet Fuel (MW=156)

Container Type: NA

9407068

@ AIR TOXICS LTD.
AN ENVIRONMENTAL ANALYTICAL LABORATORY

180 BLUE RAVINE ROAD, SUITE B
FOLSOM, CA 95630
(916) 985-1000 • FAX (916) 985-1020

CHAIN OF CUSTODY RECORD

Page 1 of 1

PROJECT # 722408.57040 PO # 722408.57 COLLECTED BY (Signature) J. Hall

REMARKS Mt. Home AFB

	FIELD SAMPLE I.D.#	SAMPLING MEDIA (Tenax, Canister etc.)	DATE/TIME	ANALYSIS	VAC./PRESSURE (Rec. 3.5")	LAB I.D. #
01A	MH-VW	Canister # 11822	7/9/94 12:00	TO-3	4.5" Hg	
02A	MH-MPA-6	Canister # 12377	7/9/94 12:02	TO-3	4.5" Hg	
03A	MH-MPC-13	Canister # 12354	7/9/94 12:05	TO-3	4.5" Hg	

RELINQUISHED BY: DATE/TIME	RECEIVED BY: DATE/TIME	RELINQUISHED BY: DATE/TIME	RECEIVED BY: DATE/TIME
J. Hall / Fed Ex 7/11/94 10:00	ATL 7/12/94 9:44		

LAB USE ONLY

SHIPPER NAME	AIR BILL #	OPENED BY: DATE/TIME	TEMP(°C)	CONDITION
Fed-X	1768961886	7/12/94 9:44	Room	Good

REMARKS Custody Seal intact? Y N (None) Temp. Room

Initial Respiration Test
POL Yard
Mt. Home AFB

Monitoring Point	Date	Days Elapsed (frac. days)	Time	Hrs elapsed (fractional days)	Days Elapsed	Elapsed Time (min. x 1000)	O2%	CO2%	Total Hydro-carbon	Helium	Comments	Trend of O2/ Time	New x-values	k
MPA-6	07/10/94	0.00	10:21	0.00	0.00	0.00	20.0	0.05	0	4.2		19.8402468	0	0.011385
MPA-6	07/10/94	0.00	11:36	0.05	0.05	0.08	19.6	0.10	800	3.2		-0.5389901	1.79	
MPA-6	07/10/94	0.00	13:17	0.12	0.12	0.18	18.3	0.20	1,920	3.2				
MPA-6	07/10/94	0.00	18:34	0.34	0.34	0.49	13.1	0.20	2,000	3.0				
MPA-6	07/11/94	1.00	08:25	-0.08	0.92	1.32	3.6	0.45	3,000	3.6				
MPA-6	07/11/94	1.00	12:09	0.08	1.08	1.55	1.9	0.45	2,800	2.6				
MPA-6	07/11/94	1.00	16:14	0.25	1.25	1.79	0.8	0.45	3,000	1.9				
MPA-6	07/12/94	2.00	10:45	0.02	2.02	2.90	0.1	0.60	2,400	2.2	Hydrocarbon meter drifted; concentration is at least 150 ppm higher			
MPA-13	07/10/94	0.00	10:26	0.00	0.00	0.00	18.5	1.40	> 20000	3.3		17.8000064	0	0.004509
MPA-13	07/10/94	0.00	11:40	0.05	0.05	0.07	18.0	1.40	> 20000	3.3		4.67927184	2.91	
MPA-13	07/10/94	0.00	13:21	0.12	0.12	0.18	17.3	1.40	> 20000	3.0				
MPA-13	07/10/94	0.00	18:38	0.34	0.34	0.49	15.0	1.40	> 20000	2.9				
MPA-13	07/11/94	1.00	08:27	-0.08	0.92	1.32	11.3	1.60	> 20000	4.0				
MPA-13	07/11/94	1.00	12:24	0.08	1.08	1.56	10.0	1.60	> 20000	3.1				
MPA-13	07/11/94	1.00	16:18	0.24	1.24	1.79	8.8	1.70	> 20000	2.5				
MPA-13	07/12/94	2.00	10:51	0.02	2.02	2.91	6.0	1.80	> 20000	2.4				
MPA-19	07/10/94	0.00	10:34	0.00	0.00	0.00	20.1	0.05	2,000	3.4		19.939095	0	0.002174
MPA-19	07/10/94	0.00	11:43	0.05	0.05	0.07	19.9	0.10	3,800	3.3		13.6340855	2.9	
MPA-19	07/10/94	0.00	13:23	0.12	0.12	0.17	19.5	0.20	5,200	3.0				
MPA-19	07/10/94	0.00	18:44	0.34	0.34	0.49	18.9	0.20	7,000	2.4				
MPA-19	07/11/94	1.00	08:31	-0.09	0.91	1.32	16.9	0.30	9,400	3.8				
MPA-19	07/11/94	1.00	12:27	0.08	1.08	1.55	16.5	0.30	8,600	2.8				
MPA-19	07/11/94	1.00	16:20	0.24	1.24	1.79	15.8	0.30	10,600	2.3				
MPA-19	07/12/94	2.00	10:55	0.01	2.01	2.90	13.9	0.35	6,400	3.0	Hydrocarbon meter drifted; concentration is at least 150 ppm higher			
MPB-6	07/10/94	0.00	10:39	0.00	0.00	0.00	14.9	2.50	13,800	3.0		6.25894212	0	0.002906
MPB-6	07/10/94	0.00	11:45	0.05	0.05	0.07	4.1	8.30	13,600	2.8		-2.1688566	2.9	
MPB-6	07/10/94	0.00	13:25	0.12	0.12	0.17	3.1	9.00	14,200	2.5				
MPB-6	07/10/94	0.00	18:48	0.34	0.34	0.49	1.7	9.70	13,400	2.1				
MPB-6	07/11/94	1.00	08:36	-0.09	0.91	1.32	0.8	10.20	13,200	2.5				
MPB-6	07/11/94	1.00	12:38	0.08	1.08	1.56	0.7	10.50	12,000	1.7				
MPB-6	07/11/94	1.00	16:24	0.24	1.24	1.79	0.5	11.00	13,800	1.3				
MPB-6	07/12/94	2.00	11:00	0.01	2.01	2.90	0.2	10.20	> 20000	1.5				

Initial Respiration Test
POL Yard
Mt. Home AFB

Monitoring Point	Date	Days Elapsed (frac. days)	Time	Hrs elapsed (fractional days)	Days Elapsed	Elapsed Time (min. x 1000)	O2%	CO2%	Total Hydro-carbon	Helium	Comments	Trend of O2/ Time	New x-values	k
MPB-13	07/10/94	0.00	10:40	0.00	0.00	0.00	19.7	0.10	480	3.3		18.3342769	0	0.005975
MPB-13	07/10/94	0.00	11:51	0.05	0.05	0.07	18.8	0.14	1,080	3.3		1.00690272	2.9	
MPB-13	07/10/94	0.00	13:29	0.12	0.12	0.17	17.6	0.25	1,260	3.0				
MPB-13	07/10/94	0.00	18:51	0.34	0.34	0.49	14.5	0.25	2,400	2.8				
MPB-13	07/11/94	1.00	08:39	-0.08	0.92	1.32	9.2	0.30	4,000	4.2				
MPB-13	07/11/94	1.00	12:41	0.08	1.08	1.56	8.0	0.25	3,400	3.0				
MPB-13	07/11/94	1.00	16:27	0.24	1.24	1.79	6.1	0.35	4,000	2.5				
MPB-13	07/12/94	2.00	10:59	0.01	2.01	2.90	3.2	0.25	3,000	2.9				
MPB-19	07/10/94	0.00	10:45	0.00	0.00	0.00	13.9	3.00	>20000	2.9		11.4738509	0	0.004030
MPB-19	07/10/94	0.00	11:57	0.05	0.05	0.07	12.1	3.00	>20000	2.7		-0.2139391	2.9	
MPB-19	07/10/94	0.00	13:32	0.12	0.12	0.17	10.8	3.20	>20000	2.5				
MPB-19	07/10/94	0.00	18:54	0.34	0.34	0.49	8.1	3.20	>20000	2.1				
MPB-19	07/11/94	1.00	08:43	-0.08	0.92	1.32	4.5	3.40	>20000	2.9				
MPB-19	07/11/94	1.00	12:45	0.08	1.08	1.56	3.3	3.50	>20000	2.1				
MPB-19	07/11/94	1.00	16:29	0.24	1.24	1.78	3.3	3.50	>20000	1.6				
MPB-19	07/12/94	2.00	11:00	0.01	2.01	2.90	2.4	3.40	>20000	2.0				
MPB-25	07/10/94	0.00	10:46	0.00	0.00	0.00	6.0	7.10	>20000	2.1		4.8150817	0	0.002861
MPB-25	07/10/94	0.00	12:00	0.05	0.05	0.07	4.9	7.20	>20000	2.0		-0.3053095	1.79	
MPB-25	07/10/94	0.00	13:34	0.12	0.12	0.17	3.9	7.20	>20000	1.7				
MPB-25	07/10/94	0.00	18:57	0.34	0.34	0.49	2.1	7.50	>20000	1.6				
MPB-25	07/11/94	1.00	08:47	-0.08	0.92	1.32	0.6	7.80	>20000	2.2				
MPB-25	07/11/94	1.00	12:49	0.09	1.09	1.56	0.3	7.90	>20000	1.5				
MPB-25	07/11/94	1.00	16:32	0.24	1.24	1.79	0.5	8.10	>20000	1.3				
MPC-7	07/10/94	0.00	10:55	0.00	0.00	0.00	7.9	9.60	1,900	2.3		7.11156744	0	0.002119
MPC-7	07/10/94	0.00	12:02	0.05	0.05	0.07	7.1	10.20	1,900	2.3		0.98833111	2.89	
MPC-7	07/10/94	0.00	13:38	0.11	0.11	0.16	7.0	10.40	2,000	2.1				
MPC-7	07/10/94	0.00	18:59	0.34	0.34	0.48	5.6	10.40	2,200	1.6				
MPC-7	07/11/94	1.00	08:50	-0.09	0.91	1.32	4.0	10.30	2,000	2.1				
MPC-7	07/11/94	1.00	12:51	0.08	1.08	1.56	3.4	10.80	1,540	1.4				
MPC-7	07/11/94	1.00	16:34	0.24	1.24	1.78	2.4	11.60	1,720	1.1				
MPC-7	07/12/94	2.00	11:07	0.01	2.01	2.89	2.0	10.50	2,200	1.0				

Initial Respiration Test
POL Yard
Mt. Home AFB

Monitoring Point	Date	Days Elapsed (frac. days)	Time	Hrs elapsed (fractional days)	Days Elapsed	Elapsed Time (min. x 1000)	O2%	CO2%	Total Hydro-carbon	Helium	Comments	Trend of O2/ Time	New x-values	k
MPC-13	07/10/94	0.00	10:57	0.00	0.00	0.00	3.7	9.60	11,800	2.2		3.24881597	0	0.002111
MPC-13	07/10/94	0.00	12:05	0.05	0.05	0.07	3.5	9.90	11,400	2.4		-0.5092345	1.78	
MPC-13	07/10/94	0.00	13:41	0.11	0.11	0.16	3.0	10.00	10,000	2.3				
MPC-13	07/10/94	0.00	19:04	0.34	0.34	0.49	1.1	10.20	12,600	1.8				
MPC-13	07/11/94	1.00	08:53	-0.09	0.91	1.32	0.0	9.80	15,000	2.1				
MPC-13	07/11/94	1.00	12:54	0.08	1.08	1.56	0.1	10.00	14,000	1.4				
MPC-13	07/11/94	1.00	16:37	0.24	1.24	1.78	0.0	10.50	16,200	1.1				
MPC-19	07/10/94	0.00	11:00	0.00	0.00	0.00	0.0	9.70	>20000	0.0		0.13493088	0	0.000064
MPC-19	07/10/94	0.00	12:08	0.05	0.05	0.07	0.0	9.80	>20000	0.0		0.02081872	1.78	
MPC-19	07/10/94	0.00	13:44	0.11	0.11	0.16	0.5	9.70	>20000	0.0				
MPC-19	07/10/94	0.00	19:06	0.34	0.34	0.49	0.0	9.90	>20000	0.0				
MPC-19	07/11/94	1.00	08:57	-0.09	0.91	1.32	0.0	9.90	>20000	0.3				
MPC-19	07/11/94	1.00	12:58	0.08	1.08	1.56	0.1	9.90	>20000	0.1				
MPC-19	07/11/94	1.00	16:41	0.24	1.24	1.78	0.0	10.40	>20000	0.1				
MPD-7	07/09/94	0.00	12:36	0.00	0.00	0.00	19.6	1.40	240			19.6	0	0.000085
MPD-7	07/10/94	1.00	14:14	0.07	1.07	1.54	19.5	1.50	340			19.49987	1.54	
MPD-14	07/09/94	0.00	12:41	0.00	0.00	0.00	18.4	2.00	260			18.4	0	-0.000260
MPD-14	07/10/94	1.00	14:18	0.07	1.07	1.54	18.8	1.80	340			18.8007807	1.54	
VW	07/10/94	0.00	11:07	0.00	0.00	0.00	19.7	0.30	2,000	3.2		18.5818616	0	0.004301
VW	07/10/94	0.00	12:12	0.05	0.05	0.07	19.0	0.20	3,400	3.1		6.28002361	2.86	
VW	07/10/94	0.00	13:50	0.12	0.12	0.17	17.9	0.50	5,600	3.0				
VW	07/10/94	0.00	19:10	0.34	0.34	0.49	14.5	0.75	8,800	2.5				
VW	07/11/94	1.00	09:02	-0.08	0.92	1.32	11.7	0.80	16,000	3.4				
VW	07/11/94	1.00	13:05	0.09	1.09	1.57	11.5	0.90	16,400	2.3				
VW	07/11/94	1.00	16:46	0.24	1.24	1.79	12.4	0.85	20,000	2.1	Blower installed			
VW	07/12/94	2.00	10:41	-0.01	1.99	2.86	6.4	2.20	12,600	2.9	Trouble calibrating O2/CO2			

Initial

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

enter data | calculated data

QC-BRB. 8-31-94

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: VW

K_o = max. observed rate 0.0043 %/min.

w = moisture content 17 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.

Solving for 1 liter of soil

a) $V_v = n * 1$ L

V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$

S_r = 0.55 S_r = degree of saturation

c) $V_w = S_r \times V_v$

V_w = 0.25 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$

V_a = 0.20 liters V_w = volume of water

e) Bulk density = ^{g}d + (V_w x ^{g}w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.118 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 1021 mg TPH/year

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

enter data | calculated data

Initial

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPA–6 K_o = max. observed rate 0.0114 %/min.
w = moisture content 15.5 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry) (g/cm3):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.

Solving for 1 liter of soil

a) $V_v = n * 1$ L

V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$

S_r = 0.5 S_r = degree of saturation

c) $V_w = S_r \times V_v$

V_w = 0.23 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$

V_a = 0.22 liters V_w = volume of water

e) Bulk density = ^{g}d + ($V_w \times {}^g$w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.129 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 2959.3 mg TPH/year

Initial

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

enter data | calculated data

QC-BRB 8-31-94

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPA–13 K_o = max. observed rate 0.0045 %/min.
w = moisture content 18 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.
Solving for 1 liter of soil

a) $V_v = n * 1$ L
V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$
S_r = 0.58 S_r = degree of saturation

c) $V_w = S_r \times V_v$
V_w = 0.26 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$
V_a = 0.19 liters V_w = volume of water

e) Bulk density = ^{g}d + (V_w x ^{g}w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.112 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 1014.2 mg TPH/year

Initial

QC- BRA-8-31-94

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

enter data | calculated data

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPA–19

K_o = max. observed rate 0.0022 %/min.

w = moisture content 17.5 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.

Solving for 1 liter of soil

a) $V_v = n * 1$ L

V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$

S_r = 0.57 S_r = degree of saturation

c) $V_w = S_r \times V_v$

V_w = 0.26 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$

V_a = 0.19 liters V_w = volume of water

e) Bulk density = ^{g}d + (V_w x ^{g}w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.112 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 495.8 mg TPH/year

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

Initial

enter data | calculated data

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

QC - BAB 8-31-94

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPB–6 K_o = max. observed rate 0.0029 %/min.
w = moisture content 15.5 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.
Solving for 1 liter of soil

a) $V_v = n * 1$ L
V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$
S_r = 0.5 S_r = degree of saturation

c) $V_w = S_r \times V_v$
V_w = 0.23 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$
V_a = 0.22 liters V_w = volume of water

e) Bulk density = ^{g}d + ($V_w \times {}^g$w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.129 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 752.8 mg TPH/year

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

Initial

enter data | calculated data

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

QC-BRM
8-31-94

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPB–13

K_o = max. observed rate 0.0060 %/min.

w = moisture content 18 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.

Solving for 1 liter of soil

a) $V_v = n * 1\ L$

V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$

S_r = 0.58 S_r = degree of saturation

c) $V_w = S_r \times V_v$

V_w = 0.26 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$

V_a = 0.19 liters V_w = volume of water

e) Bulk density = ^{g}d + (V_w x ^{g}w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.112 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 1352.3 mg TPH/year

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

enter data | calculated data

Initial

QC-BNB 6-30-94

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPB–19

K_o = max. observed rate 0.0040 %/min.

w = moisture content 17.5 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.

Solving for 1 liter of soil

a) $V_v = n * 1\ L$

V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$

S_r = 0.57 S_r = degree of saturation

c) $V_w = S_r \times V_v$

V_w = 0.26 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$

V_a = 0.19 liters V_w = volume of water

e) Bulk density = ^{g}d + (V_w x ^{g}w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.112 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 901.5 mg TPH/year

Initial

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

enter data | calculated data

QC-BRB 6-31-94

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPB–25 K_o = max. observed rate 0.0029 %/min.
w = moisture content 17.5 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.
Solving for 1 liter of soil

a) $V_v = n * 1$ L
V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$
S_r = 0.57 S_r = degree of saturation

c) $V_w = S_r \times V_v$
V_w = 0.26 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$
V_a = 0.19 liters V_w = volume of water

e) Bulk density = ^{g}d + (V_w x ^{g}w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.112 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 653.6 mg TPH/year

Initial

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

enter data | calculated data

Q.C. BRB 6-31-94

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPC–7

K_o = max. observed rate: 0.0021 %/min.

w = moisture content: 15.5 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.

Solving for 1 liter of soil

a) $V_v = n * 1\ L$

V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$

S_r = 0.5 S_r = degree of saturation

c) $V_w = S_r \times V_v$

V_w = 0.23 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$

V_a = 0.22 liters V_w = volume of water

e) Bulk density = ^{g}d + (V_w x ^{g}w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.129 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 545.1 mg TPH/year

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

Initial

enter data | calculated data

ac-BRB 4-30-94

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPC–13

K_o =	max. observed rate	0.0021	%/min.
w =	moisture content	18	%

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e = n/1–n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.

Solving for 1 liter of soil

a) $V_v = n * 1$ L

V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$

S_r = 0.58 S_r = degree of saturation

c) $V_w = S_r \times V_v$

V_w = 0.26 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$

V_a = 0.19 liters V_w = volume of water

e) Bulk density = ^{g}d + ($V_w \times {}^g$w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.112 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 473.3 mg TPH/year

Initial

MT. HOME AFB – POL YARD
Biodegradation Rate Calculations

enter data | calculated data

Formula: $K_b = K_o \times 1/100\% \times A \times D_o \times C$ Where:

K_b = fuel biodegradation rate

K_o = O_2 utilization rate (%/min.)

A = volume of air/kg soil

D_o = O_2 density 1340 mg/L

C = Carbon/O_2 ratio for hexane mineralization = 1/3.5

Test Results: MPC–19 K_o = max. observed rate 0.0001 %/min.
w = moisture content 17.5 %

Assume: Soil properties for Silt and Sand Specify from Table 1.4 (Ref. Foundation Engineering, Peck, Hanson, and Thornburn, John Wiley Press, 1974)

Porosity:	*n* =	0.45
Unit weight (dry):	^{g}d =	1.43
Void ratio:	*e* = *n*/1–*n* =	0.82
Specific gravity:	G =	2.65

Calculate A = Air filled volume (V_a)/unit wt.
Solving for 1 liter of soil

a) $V_v = n * 1$ L
V_v = 0.45 liters V_v = void volume

b) $S_r = Gw/e$
S_r = 0.57 S_r = degree of saturation

c) $V_w = S_r \times V_v$
V_w = 0.26 liters V_w = volume of water

d) $V_a = V_v - V_{vw}$
V_a = 0.19 liters V_w = volume of water

e) Bulk density = ^{g}d + ($V_w \times {}^g$w) = 1.7 kg/l soil

f) A = V_a/Bulk density = 0.112 l air/kg soil

$K_b = K_o \times 1/100\% \times A \times D_o \times C \times$ 525,600 min/yr = 22.5 mg TPH/year

Mt. Home AFB, POL Yard, Initial

QC'd BRD 8/30/94

Steady–state Equation – Air Injection

Enter data

Calculated data

$$k = \frac{Q \mu \ln(Rw/Ri)}{H \pi Patm [1 - (Pw/Patm)^2]}$$

Where:

Q = Volumetric flow rate of vent well

20	scfm x (30.48 cm/ft)^3 x (1 min/60 s) =	9.44E+03	cm^3/s
μ = Viscosity of Air @ 18° C =		1.80E–04	g/cm s

Patm = Ambient pressure @ ____ feet of elevation (use Excel table to get this number)

365	inches H2O x (3.61E–2 psia/in. H2O) =	13.177	psia
13.177	psia x (6.89476E4 g/cm s²)/psia =	9.08E+05	g/cm s²

Rw = Radius of Vent Well

2	inches x 2.54 cm/in =	5.08	cm

H = Depth of Screen (length of screened interval)

14	feet x 30.48 cm/ft =	427	cm

Ri = Maximum Radius of Venting Influence

30.8	feet x 30.48 cm/ft =	939	cm

Pw = Absolute Pressure at Vent Well

8.5	inches H2O x (3.61E–2 psia/in. H2O) =	0.307	psia
0.307	psia + 13.177 psia =	13.483	psia
13.483	psia x (6.89476E4 g/cm s²)/psia =	9.30E+05	g/cm s²

	k =	1.545E–07	cm²
1.545E–07	cm² x (1 m/100 cm)² =	1.550E–11	m²
1.550E–11	m² x 1 darcy/(9.870E–13 m²) =	15.7	darcys

APPENDIX B
O&M CHECKLIST

APPENDIX B

OPERATION AND MAINTENANCE INSTRUCTIONS

This appendix is intended to supplement the Interim Results Report, not to replace the operations and maintenance (O&M) manual provided to Mt. Home Air Force Base (AFB). Please refer to the O&M manual for more detail.

1.0 BLOWER/MOTOR MAINTENANCE

A 1-horsepower Gast® regenerative blower has been installed at the POL Yard Area 3, Site ST-38 at Mt. Home AFB. The blower and motor are relatively maintenance free. There is no lubrication required because the blower and motor have sealed bearings. If a blower system is in need of repair, please contact Mr. Doug Downey of Engineering-Science, Inc. (ES) in Denver, Colorado at (303) 831-8100.

2.0 FILTER MAINTENANCE

To avoid damage caused by passing solids through the blower, an air filter has been installed inline before the blower. Continuous ingestion of solids will damage or imbalance the impellers. The inline air filter will prevent solids from entering the blower and is rated at 99-percent efficiency to 10 microns.

The paper filter element is replaceable. The filter should be checked weekly for the first 2 months of operation. The air filter should be replaced when the pressure difference across the filter reaches 15 to 20 inches of water. It will be the responsibility of Mt. Home AFB personnel to determine the best schedule for filter replacement depending on the results of the initial observations.

The filter can be checked after turning off the blower system. To remove the filter, loosen the clamps, lift the metal top off of the air filter, and lift the air filter from the metal housing. When replacing the filter, be careful to ensure that the rubber seals remain in place. ES has provided Mt. Home AFB with a supply of air filters for the next year of blower operation. Should additional air filters be required, they can be ordered from Solberg Manufacturing, Inc. in Itasca, Illinois. Their phone number is (708) 773-1363. It is recommended that Mt. Home AFB keep a spare air filter at the site.

3.0 BLOWER PERFORMANCE MONITORING

To monitor the blower performance, vacuum, pressure, and temperature must be measured. These data should be recorded on the data collection sheets provided. All measurements will be taken at the same time while the system is running.

3.1 Pressure/Vacuum

Open the shed roof and record the pressure and vacuum readings directly from the gauges in inches of water. Pressure readings are necessary to determine design parameters, and to verify that the blower is operating correctly. Vacuum readings are necessary to assure that the filter is clean. Record the measurements on the data collection sheet provided.

3.2 Temperature

Open the shed roof and record the temperature readings directly from the gauges in degrees Fahrenheit (°F). Record the measurements on the data collection sheet provided. Temperature readings are necessary to verify that the blower is operating correctly. The temperature should remain relatively constant with time. Should the temperature rise substantially in a short period of time, a problem may exist within the blower. Ambient air temperature fluctuations will affect the temperature readings but the temperature rise across the blower should not vary by more than 20°F.

4.0 MONITORING SCHEDULE

The following monitoring schedule is recommended for this system. During the initial months of operation, more frequent monitoring is recommended to ensure that any start up problems are quickly corrected. Data collection sheets have been provided for use by Mt. Home AFB personnel during data collection.

Monitoring Item	Monitoring Frequency
Blower pressure, vacuum, and temperature	Weekly.
Filter change	As required. When vacuum across filter exceeds 15 inches of water

BLOWER INJECTION SYSTEM DATA COLLECTION SHEET

SITE:_____

DATE	TIME	INLET VACUUM (IN. WATER)	OUTLET TEMP. (DEGREES F)	OUTLET PRESSURE (IN. WATER)	FILTER CHANGED (Y or N)	BLOWER FUNCTIONING UPON ARRIVAL (Y or N)	COMMENTS	CHECKED BY